

specification showing changes in relation to the specification originally submitted in the parent application.

REMARKS

Claims 7-17 are pending.

Claims 7-17 are rejected.

The drawings are objected to.

I. Objection to the drawings

Per the Examiner's comments, Applicants are submitting substitute formal drawings to the Draftsperson. For the Examiner's convenience, Applicants have included a redlined copy of these drawings in Appendix 1 of this Response.

II. Rejection of claims under 35 U.S.C. §112 ¶1

The Examiner rejected claim 13 and its dependent claims 14-16 for including the limitation "ensuring at most a minimum bond pad clearance" and rejected claim 17 based on the limitation requiring "less than a maximum underlying bond pad clearance." The Examiner attempted to support the rejection by arguing that the claims are broad enough to include within their scope an embodiment that the Examiner does not believe is enabled by the Specification. Specifically, the Examiner envisioned an embodiment wherein the bond pads are covered by an overlying chip.

Significantly, the Examiner raised a similar argument in the previous Office Action dated November 16, 2000 (p. 2-3). Applicants responded to that argument in the Appeal Brief, wherein Applicants pointed out that case precedent supports a finding that the claims are adequately supported. (Appeal Brief at 6.) Applicants contend that the response from the Appeal Brief applies to the current rejections. Specifically, Applicants cited *In re Vickers* (141 F.2d 522, 61 U.S.P.Q. 122 (C.C.P.A. 1944)), where the examiner of that application rejected claims because, although they covered an embodiment disclosed in the specification, they also covered a

mechanical apparatus that was *not* disclosed in the specification. (*Id.* at 124, 127. Copies of this and other cases cited herein are included in appendices to this Response.) The Court indicated that such a rejection is not in accordance with the applicable rule, namely: it is not necessary to disclose each specific embodiment of the invention covered by the claims; rather, in a mechanical case, broad claims may be supported by disclosure of a single form of the apparatus disclosed in an application. (*Id.* at 127.)

The relevant facts of the current application are analogous to those in *Vickers*. As in that case, the Examiner has argued that the rejected claims cover matters that are not addressed in the specification. However, it is undisputed that the claims are supported by embodiments addressed in the specification. Hence, the rule in *Vickers* applies to the mechanics of claim 13's stacking chips and claim 17's arranging dies, thereby indicating that those claims satisfy 112's enablement requirement. Also significant is the fact that the Examiner has yet to address the *Vickers* case.

Additional case precedent provides further support. In *Spectra-Physics, Inc. v. Coherent, Inc.* (827 F.2d 1524, 3 U.S.P.Q.2d 1737 (Fed. Cir. 1987), *cert. denied*, 484 U.S. 954 (1987)), the relevant patents were invalidated for lack of enablement based on their failure to disclose a particular brazing cycle relevant to the patents' laser technology. (*Id.* at 3 U.S.P.Q.2d 1743.) The Federal Circuit, however, noted that the specifications identified alternatives to that cycle. (*Id.*) In finding sufficient enablement, the Federal Circuit pointed out that "[n]onenablement is the failure to disclose *any* mode" (*id.* at 1744 (emphasis in original)) and added that

[i]f an invention pertains to an art where the results are predictable, e.g., mechanical as opposed to chemical arts, a broad claim can be enabled by disclosure of a single embodiment . . . and is not invalid for lack of enablement simply because it reads on another embodiment of the invention which is inadequately disclosed

(*Id.* at 1743 (citations omitted).)

The relevant facts of the current application are again analogous. Specifically, the invention pertains to the relatively predictable art concerning the mechanics of stacking chips and arranging dies. Further, it is undisputed that Applicants have disclosed multiple embodiments -- more than the "single embodiment" required by the Court in *Spectra*. Hence, given the modes

that the specification does disclose and the standard set forth by the Court in *Spectra*, the claims cannot be rejected for lack of enablement.

As support for the rejection, the Examiner cited section 2164.08 of the MANUAL OF PATENT EXAMINING PROCEDURE (MPEP). A careful reading of the language in that section, however, actually supports Applicants' position. Section 2164.08(b) of the MPEP indicates that the "presence of inoperative embodiments within the scope of a claim does not necessarily render a claim nonenabled." The MPEP goes on to remind the Examiner that the "standard is whether a skilled person could determine which embodiments that were conceived, but not yet made, would be inoperative with expenditure of no more effort than is normally required in the art." (*Id.*)

Assuming only for the sake of argument that the Examiner has managed to articulate an inoperative embodiment, the Examiner's mere identification of such is insufficient to reject the claim for failure to enable. Rather, the Examiner must then consider the standard addressed immediately above. Applicants contend that the Examiner's failure to do so amounts to a failure to meet the *prima facie* burden for rejection.

Moreover, the Examiner's argument actually suggests that the *prima facie* burden cannot be met. Specifically, it is significant that the Examiner appears to be able to argue which embodiments that were conceived, but not yet made, would be inoperative. The Examiner's efforts suggest that a skilled person could make the same argument with expenditure of no more effort than is normally required in the art, thereby satisfying the enablement standard set forth in the MPEP.

Further, it is noteworthy that mechanical arts have been characterized as predictable (*see Vickers* and *Spectra*), thereby suggesting that the artisan's efforts in determining whether the relevant embodiments were inoperative would be relatively easy and well within the effort that is normally required in the art. Applicants contend that such notions apply to the mechanics of stacking chips and arranging dies.

Accordingly, and without comment on the specific scope of the rejected claims or the actual operability of the embodiment envisioned by the Examiner, Applicants request that the 112 rejection be withdrawn.

II. Rejection of claims under 35 U.S.C. §102

The Examiner rejected the pending claims as being anticipated by de Givry (European Patent 489,643). Applicants contend that the relevant claims in their current state contain limitations that de Givry fails to disclose.

A. Claims 7-8.

Claim 7, for example, requires defining a *minimum* angular offset with the act of mounting an upper die on a lower die. In an attempt to support the rejection, the Examiner cited de Givry's figure 1. (Office Action dated 10/17/01 at 3.) That figure, however, illustrates two of de Givry's chips stacked at a 90 degree angle, which is the *maximum* angle at which the two chips could be crossed. Indeed, de Givry appears to emphasize crossing at this maximum angle. Specifically, de Givry indicates that the mere crossing of chips is superficial and does not itself save space. (de Givry translation at p. 4.) Such crossing, however, does define "dead areas" between the chips, where auxiliary components may be located. (*Id.* at p. 4, 6.) Thus, crossing the chips indirectly allows for a denser package. (*See id.* at p. 3-4.) It follows that minimizing de Givry's cross angle would risk providing space between the chips that is insufficient to accommodate an auxiliary component, thereby removing the true benefit that de Givry purports to offer. Further, de Givry emphasizes adding supports under the ends of its chips in order to avoid a cantilevering effect. (*Id.* at 4, 6; figure 1, 3.) Applicants contend that minimizing de Givry's cross angle would interfere with the ability to provide such support. Thus, de Givry citation not only discloses the exact opposite of claim 7's limitation but also actively discourages achieving that limitation. As a result, de Givry cannot be read to anticipate that claim or dependent claim 8.

Claim 7 also requires that the *minimum* angular offset allow access to a bonding site on the lower die. In attempting to define the phrase "minimum angular offset," the Examiner looked only at other language in the claim and concluded that *any* allowance of access to a bonding site on a lower die satisfies claim 7's "minimum angular offset" requirement. (Office Action dated

10/17/01 at 5.) The Examiner feared that to look elsewhere in an attempt to define the phrase would risk improperly reading additional limitations into the claim. (*Id.*)

However, the Examiner's conclusion that the phrase "minimum angular offset" is synonymous with anything that "allows access to a bonding site on the lower die" results in unnecessary redundancy in claim 7, thereby suggesting a flaw in the Examiner's reasoning. Based on the Examiner's argument, there would be no need for the phrase "minimum angular offset," and the claim would effectively be broadened to

7. (Implicit amendment attempted by Examiner) A method of stacking a plurality of die, comprising

mounting an upper die on a lower die; and

[defining a minimum angular offset] with said mounting, [wherein said minimum angular offset allows] allowing access to a bonding site on said lower die.

This is not what Applicants claimed. By finding two phrases in the claim to be synonymous, the Examiner has effectively ignored the import of at least one of the phrases. Such conduct by the Examiner is in direct conflict with case precedent, which states that each limitation in a claim must be given effect. (*Ex parte Wolters*, 214 U.S.P.Q. 735, 737 (Pat. & Tr. Office Bd. App. 1979).)

Further, the Examiner's limiting the attempt to define one claim phrase using only other claim language conflicts with case precedent ruling that the plain meaning, specification, and extrinsic sources can be considered in interpreting the limitations. (*Vitronics Corp. v. Conceptronic Inc.*, 90 F.3d 1576, 39 U.S.P.Q.2d 1573, 1576-77 (Fed. Cir. 1996). Other case precedent contains language directly on point.

It is entirely proper to . . . interpret what the Patentee meant by a word or phrase in the claim. *But this is not to be confused with adding an extraneous limitation appearing in the specification*, which is improper. By "extraneous," we mean a limitation read into a claim from the specification *wholly apart from any need to interpret what the patentee meant by particular words or phrases in the claim*. "Where a specification does not require a limitation,

that limitation should not be read from the specification into the claims."

(E.I du Pont de Nemours & Co. v. Phillips Petroleum Co., 849 F.2d 1430, 7 U.S.P.Q.2d 1129, 1131 (Fed. Cir. 1988), cert. denied, 488 U.S. 986 (1988) (emphasis added) (citations omitted).) The Examiner's analysis suffers from the very confusion that the Federal Circuit warned against.

Thus, in order to meet the standards set forth in case precedent, the Examiner must first give meaning to all of the terms of claim 7. (See *Wolters*, 214 U.S.P.Q. at 737). Applicants submit that doing so would result in interpreting the requirement that the "minimum angular offset allows access to a bonding site on the lower die" to mean that (1) there may be angular offsets that do not allow access to a bonding site on the lower die, but these are not within the scope of the claim; (2) there may be non-minimum angular offsets that allow access to a bonding site on the lower die (such as those disclosed by de Givry), but these, too, are not within the scope of the claim; and (3) there may be configurations that do not involve angular offset yet allow access to a bonding site on the lower die, but, once again, such configurations are not within the scope of the claim.

It then falls to the Examiner to determine what constitutes a "minimum angular offset." For that, the Examiner must consider the plain meaning of the terms in that phrase. (*Vitronics*, 39 U.S.P.Q.2d at 1576.) If the Examiner deems that additional consideration is required, case precedent directs the Examiner to consult the specification. (*Id.* at 1576-77.) Finally, if still more consideration is required, case precedent directs the Examiner to consult extrinsic sources. (*Id.*) Applicants have already presented guidance concerning the definition of "minimum angular offset" in the previously-filed Appeal Brief. (Appeal Brief at p. 1-2, 7.)

Thus, the Examiner's admitted failure to follow the standards in case precedent demonstrate a failure to meet the *prima facie* burden for rejecting claims 7 and 8. Further, given the proper consideration and interpretation of all of claim 7's limitations, as discussed above, it becomes evident that the portion of de Givry that the Examiner relies upon is in direct contradiction to the limitations of claims 7 and 8. As a result, the *prima facie* burden cannot be met relying on de Givry.

B. Claims 9-11

Claim 9 requires ensuring that the act of stacking *all* dies of a multichip module occurs with no intervening bonding step. Claim 10 requires stacking *all* dies of a multichip module before bonding wire to the dies. Claim 11 requires bonding wire to a multichip module's dies only after stacking *all* of those dies. The Examiner attempted to support the rejection of these claims by citing de Givry's fig. 3 and p. 7, ¶3 of the translated specification, which discloses attaching four chips, then carrying out "cabling." (Office Action dated 10/17/01 at 4.) Thus, the Examiner appears to be currently arguing that de Givry's stacking *four* chips, then cabling, is tantamount to stacking *all* of a module's chips, then cabling.

Significantly, the Examiner has previously interpreted de Givry as disclosing the exact opposite -- admitting that "de Givry does not teach that the bonding step is performed after all of the dies have been stacked." (Office Action dated 11/16/00 at 6 (admitting that de Givry fails to anticipate claims 9-11).) The Examiner's previous interpretation of de Givry's translated disclosure is in accordance with de Givry's teachings when taken as a whole. Specifically, it is noteworthy that de Givry generally warns that stacking all of a module's chips before any wiring takes place is unworkable because the machines used to perform the wiring are capable of accommodating only a limited difference in elevation between the ends of a wire. (de Givry translation at p. 7, ¶1.) As a result, de Givry generally teaches stacking dies into a first discrete set, then wiring the dies in that set, then stacking a second set on the first, then wiring the dies in the second set, etc. (*Id.* at ¶2.) Thus, when considering the Examiner's own prior statements and further considering the new de Givry citation in context with the rest of de Givry's teachings, the Examiner's current argument is shown to be untenable. Rather, reading the newly cited portion in context with the rest of the translated disclosure suggests that attaching a set of four chips and then cabling will be followed by de Givry stacking an additional set thereon and performing additional cabling. Such an interpretation offers the added benefit of avoiding conflict with the Examiner's previous position. This interpretation also demonstrates that de Givry discloses only the exact opposite of the limitations in claims 9-11. As a result, de Givry cannot be read to anticipate those claims.

C. Claim 12

Claim 12 requires *marginally* clearing a line of sight to contact areas of any immediately underlying die. Applicants discussed that limitation in the previously submitted Appeal Brief, referring to the plain meaning of the terms and the specification for support. (Appeal Brief at 4.) In doing so, Applicants used the terms “marginal” and “lower standard.” (*Id.*) In attempting to support the current rejection, the Examiner argued that *because* Applicants have failed to define the term “marginal” and “lower standard,” de Givry’s figure 3 could be interpreted as providing marginal clearance. (Office Action dated 10/17/01 at 6.)

First, as just indicated, Applicants did in fact provide a definition of the term “marginal.” Further, the Examiner admits as much. (*Id.* at 5-6.) Thus, the Examiner’s own admission refutes at least a portion of the basis for rejection.

Second, Applicants contend that it is inappropriate for the Examiner to require that the definition of terms, as well as the definition of the words used to define those terms, be expressly included in the claim; rather, it is the Examiner’s duty to consider the plain meaning of those terms and, if necessary, the specification and, if still necessary, extrinsic evidence. (*Vitronics* 39 U.S.P.Q.2d at 1576-77.) Applicants remind Examiner that doing so does not involve reading limitations from the specification into the claims. (*Du Pont*, 7 U.S.P.Q.2d at 1131.) Until Examiner has made that effort, the *prima facie* burden for rejecting this claim has not been met.

Third, the Examiner appears to believe that there is a relationship between the degree of success Applicants have in defining a claim term with the manner in which de Givry could be interpreted. It is unclear how or why the Examiner believes that relationship exists. Applicants contend that, regardless of Applicants’ efforts at defining, the proper interpretation of de Givry can be ascertained from the text of the reference itself. Further, a careful analysis of that text indicates that de Givry teaches away from any reasonable definition of the phrase “marginally clearing a line of sight” when discussing the orientation of the chips in de Givry’s stack. Specifically, as mentioned above, the true benefit of de Givry’s invention is to provide for a sufficient amount of “dead areas” between the chips, where auxiliary components may be located. (Translation of de Givry at p. 4, 6.) Altering the crossing angle to anything less than the maximum risks leaving space between the chips that is insufficient to accommodate an auxiliary

component. This would, in turn, adversely affect density and frustrate the main point of de Givry. (*See id.* at p. 3-4.) Further, altering the crossing angle to anything less than the maximum risks difficulty in providing the supports de Givry touts for avoiding cantilevering. (*Id.* at 4, 6; figure 1, 3.) As a result, de Givry should be interpreted as disclosing only the exact opposite of the limitation in claim 12. Accordingly, de Givry cannot be read to anticipate that claim.

D. Claim 13-16

Claim 13 requires, in addition to spiraling a plurality of chips, ensuring at most a minimum bond pad clearance to each chip of the plurality. The Examiner concludes that de Givry's figure 3 discloses ensuring at most a minimum bond pad clearance. (Office Action dated 10/17/01 at 4.) However, as addressed above, regardless of the number of chips de Givry includes in the stack, de Givry always ensures the *maximum* clearance, which helps to ensure adequate "dead space" between the chips and adequate support structures for the chip's ends. As a result, de Givry requires crossing two chips at 90 degrees (de Givry translation at 4-6; figure 1), three chips at 60 degrees (*id.*), etc. Such disclosure teaches only the opposite of the limitation expressed in claim 13 and incorporated into dependent claims 14-16.

In addition, later in the Office Action the Examiner indicates that claim 13's qualification that the bond pad clearance be "minimum" was not given attention because the claim did not define that term. (Office Action dated 10/17/01 at 6.) That, in turn, somehow affected the Examiner's interpretation of de Givry. (*Id.*) Applicants once again argue that it is the Examiner's duty to consider the meaning of the term "minimum" (*Wolters*, 214 U.S.P.Q. at 737), resorting to plain language, the specification (if necessary) and extrinsic evidence (if necessary) (*Vitronics* 39 U.S.P.Q.2d at 1576-77). Applicants again submit that that the Examiner's failure to do so up to now constitutes a failure to meet the *prima facie* burden for rejection. Moreover, Applicants again posit that de Givry's disclosure does not depend on the adequacy of Applicants attempt at definition; and that, for the reasons discussed in the paragraph above, de Givry discloses only the opposite of any reasonable definition of "minimum bond pad clearance;" hence, de Givry cannot be read to anticipate claim 13 or its dependent claims 14-16.

E. Claim 17

Claim 17 requires *serially* stacking *all* dies of a multichip device. The Examiner once again cited de Givry's figure 1 as support for the rejection. (Office Action dated 10/17/01 at 5.) However, Applicants submit that de Givry's disclosed cabling steps that occur between stacking sets of chips interrupt the serial nature of stacking *all* the chips of de Givry's module. (*See de Givry translation at p. 4, 7; see also the discussion in part II(B) above.*) Hence, de Givry discloses only the opposite of this limitation and therefore cannot anticipate the claim.

Claim 17 also requires establishing a unique orientation for each die, wherein that orientation defines *less than a maximum* underlying bond pad clearance. This limitation provides another instance of de Givry's failure to anticipate the claim, as de Givry's figure 1 illustrates two of de Givry's chips stacked at a 90 degree angle, which is the maximum angle at which the two chips could be crossed. For the reasons discussed above in part II(A), this is not an accidental configuration but one that de Givry emphasizes to ensure sufficient space for auxiliary components and die support structures. As a result, de Givry teaches only the exact opposite of yet another limitation of claim 17, making the rejection even more untenable.

Later in the Office Action, the Examiner switches to de Givry's figure 3 as the basis for rejection. (Office Action dated 10/17/01 at 6.) That figure discloses four of de Givry's chips arranged in a "star" pattern, wherein each chip is stacked at less than a 90 degree angle with respect to the underlying die. (*de Givry translation at p. 7.*) However, the bond pad clearance in this example *is* the maximum for the number of chips de Givry stacks at one time in this embodiment. As a result, this de Givry example, too, discloses only the exact opposite of claim 17's limitation. Moreover, the Examiner failed to address how de Givry's figure 3 addresses claim 17's requirement of serially stacking all of the dies in a multichip device. Hence, the *prima facie* burden for rejection based on de Givry's figure 3 embodiment has not been met. Further, for the reasons expressed above in the first paragraph of this part, Applicants contend that the *prima facie* burden for rejection based on de Givry's figure 3 embodiment cannot be met.

CONCLUSION

In light of the above remarks, Applicants submit that claims 7-17 are allowable over the applied reference. Therefore, Applicants respectfully request reconsideration of the Examiner's rejections and further requests allowance of all of the pending claims. If there are any matters which may be resolved or clarified through a telephone interview, the Examiner is requested to contact Applicants' undersigned attorney at the number indicated.

Respectfully submitted,



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Appendix 1

Clean and red-lined copy of formal drawings submitted to Draftsperson

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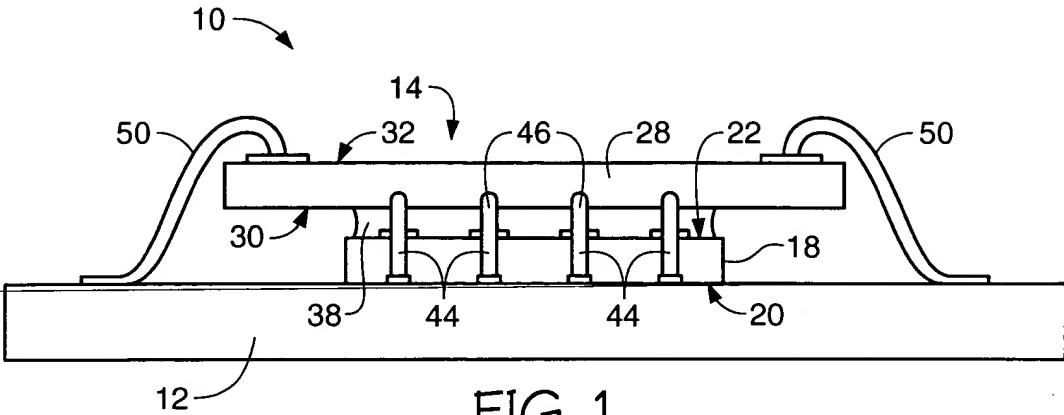


FIG. 1

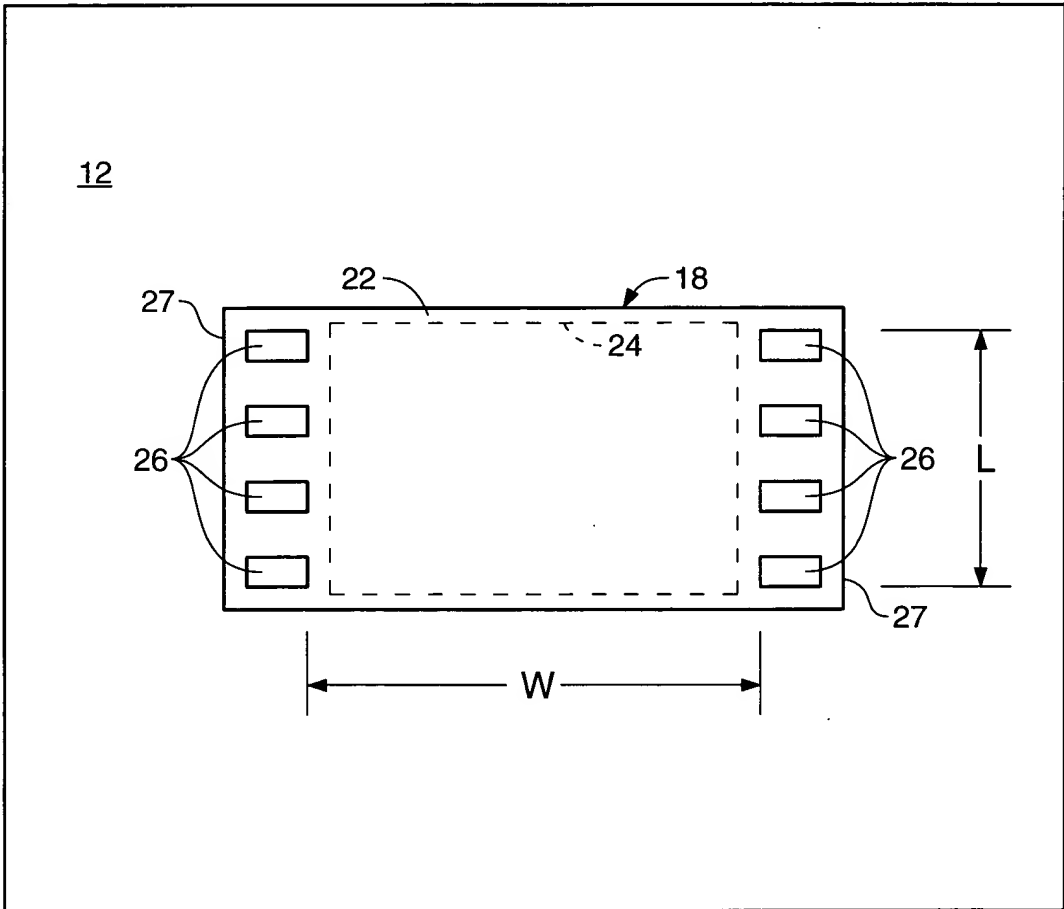


FIG. 2

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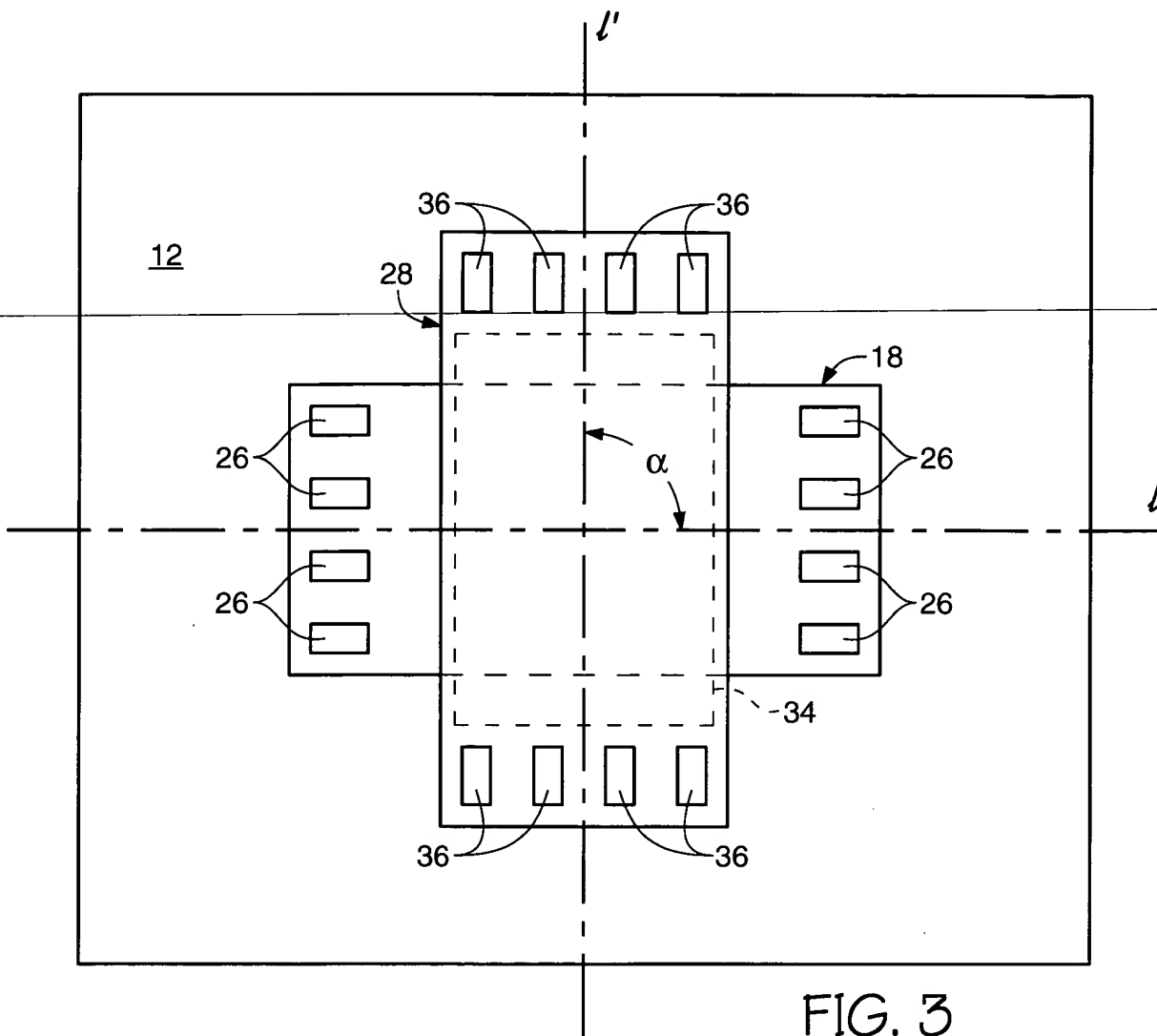


FIG. 3

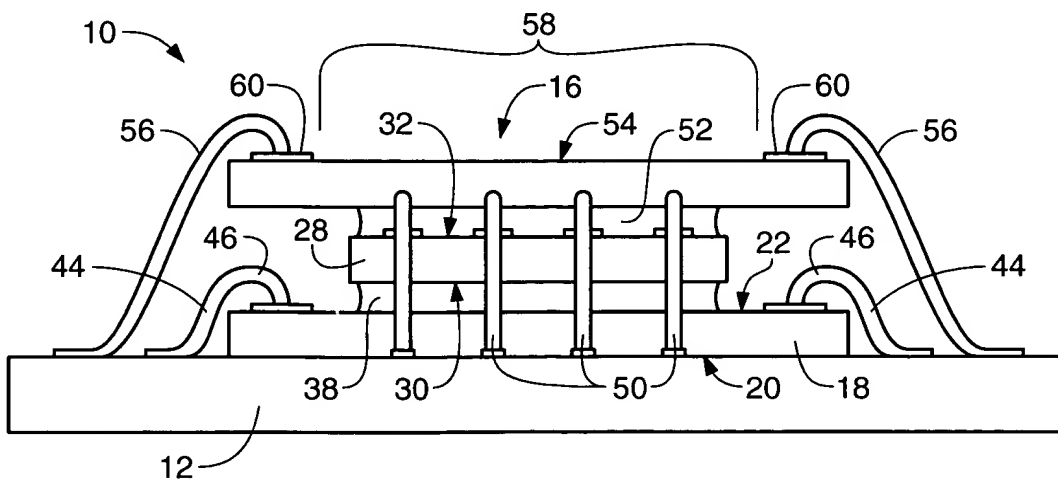


FIG. 4

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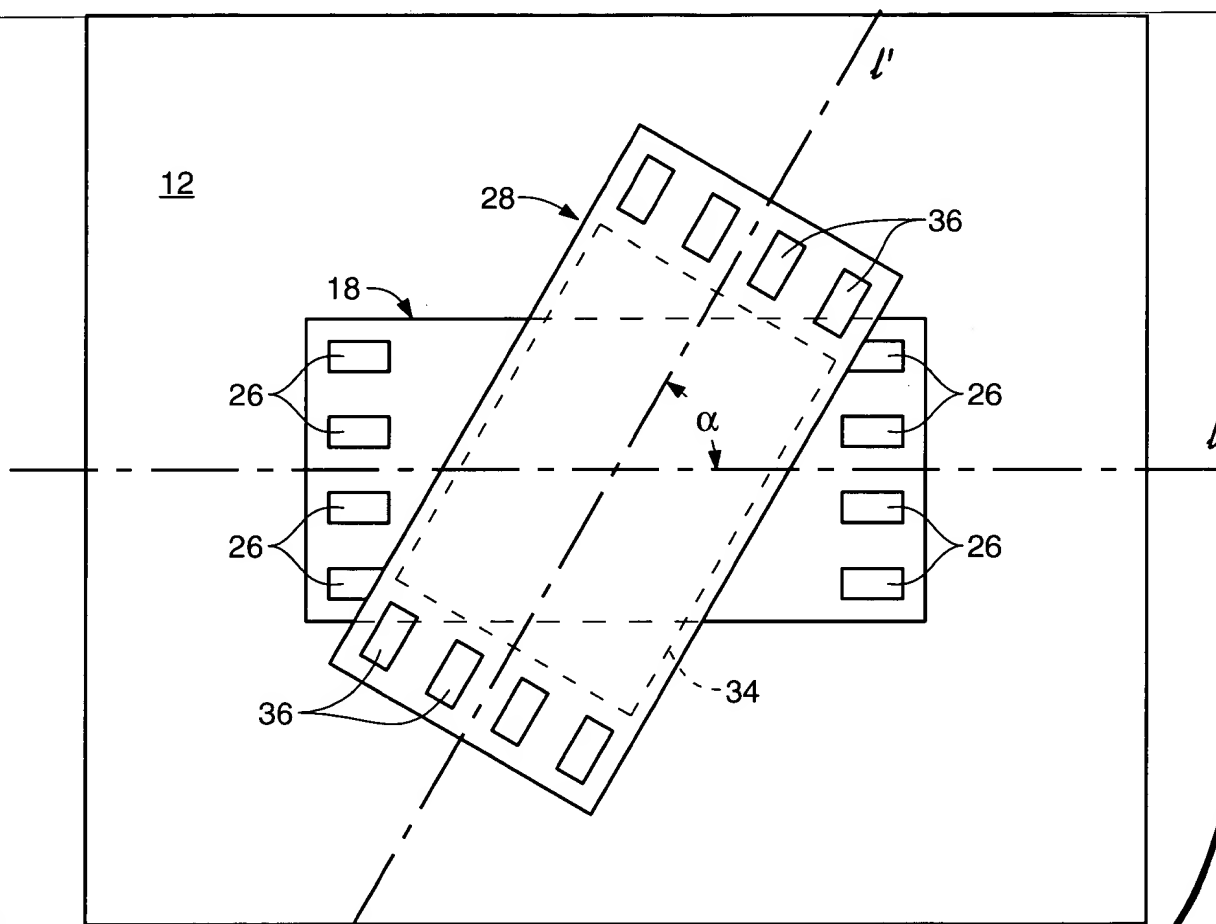
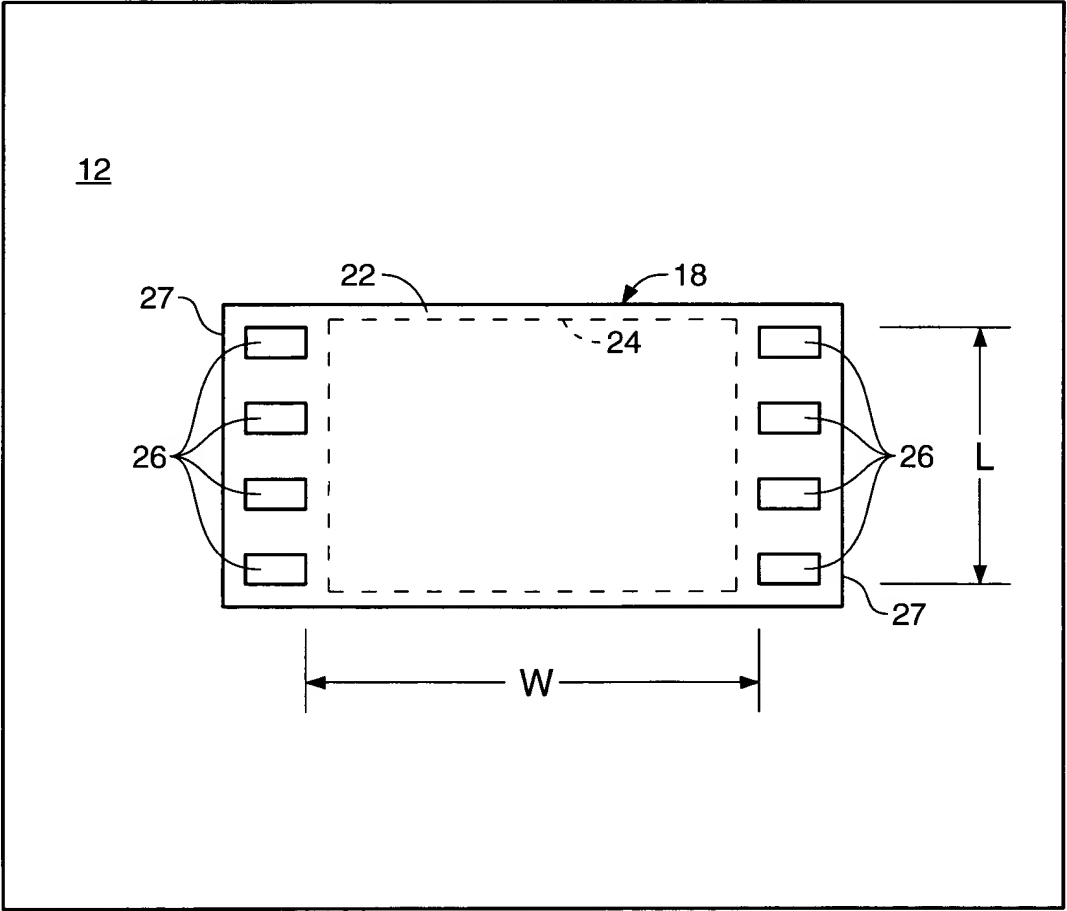
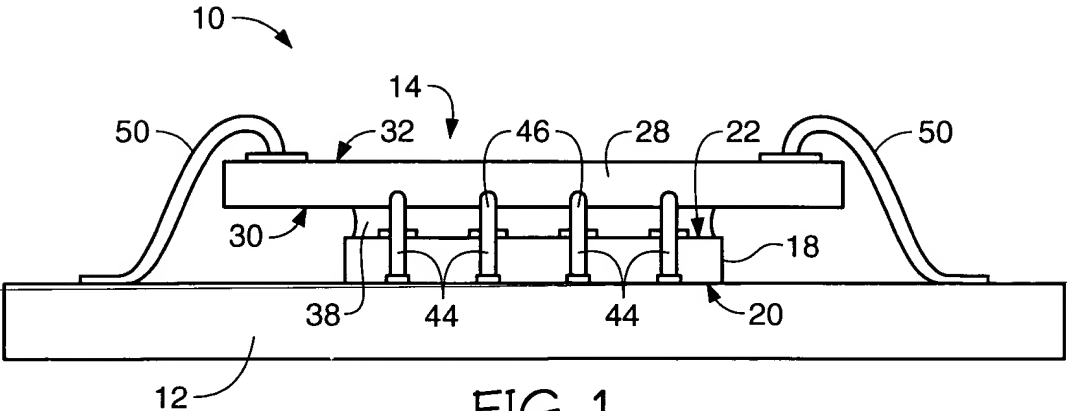


FIG. 5



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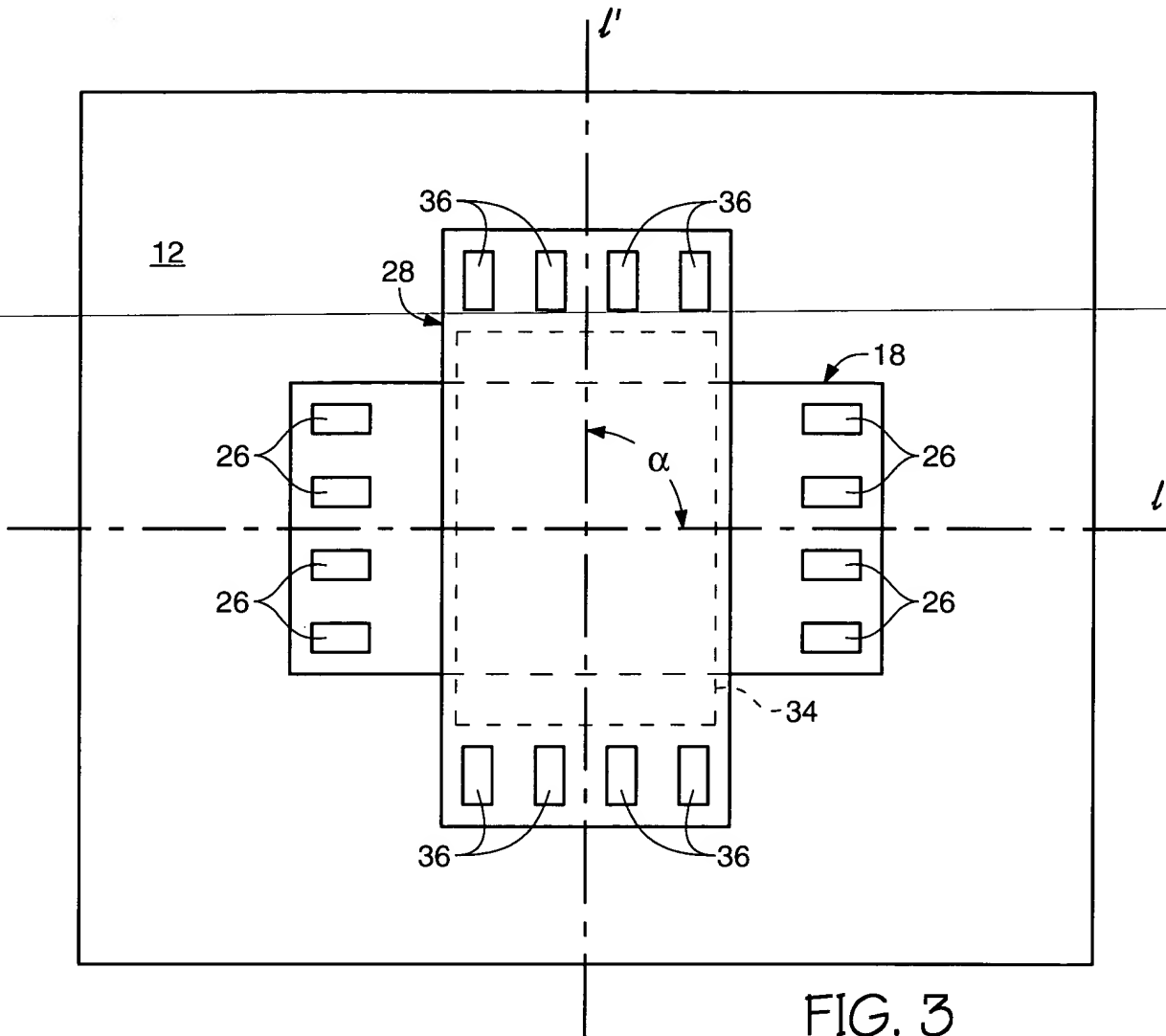


FIG. 3

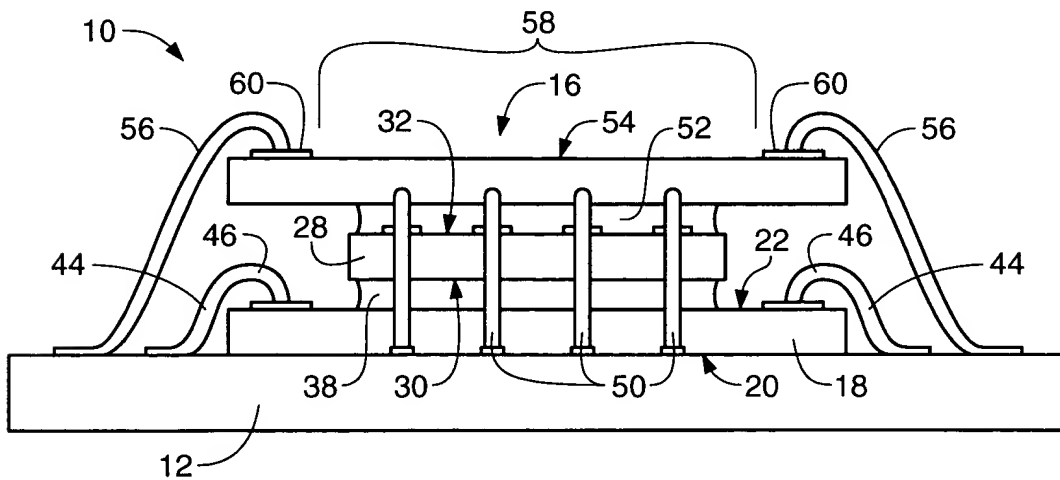


FIG. 4

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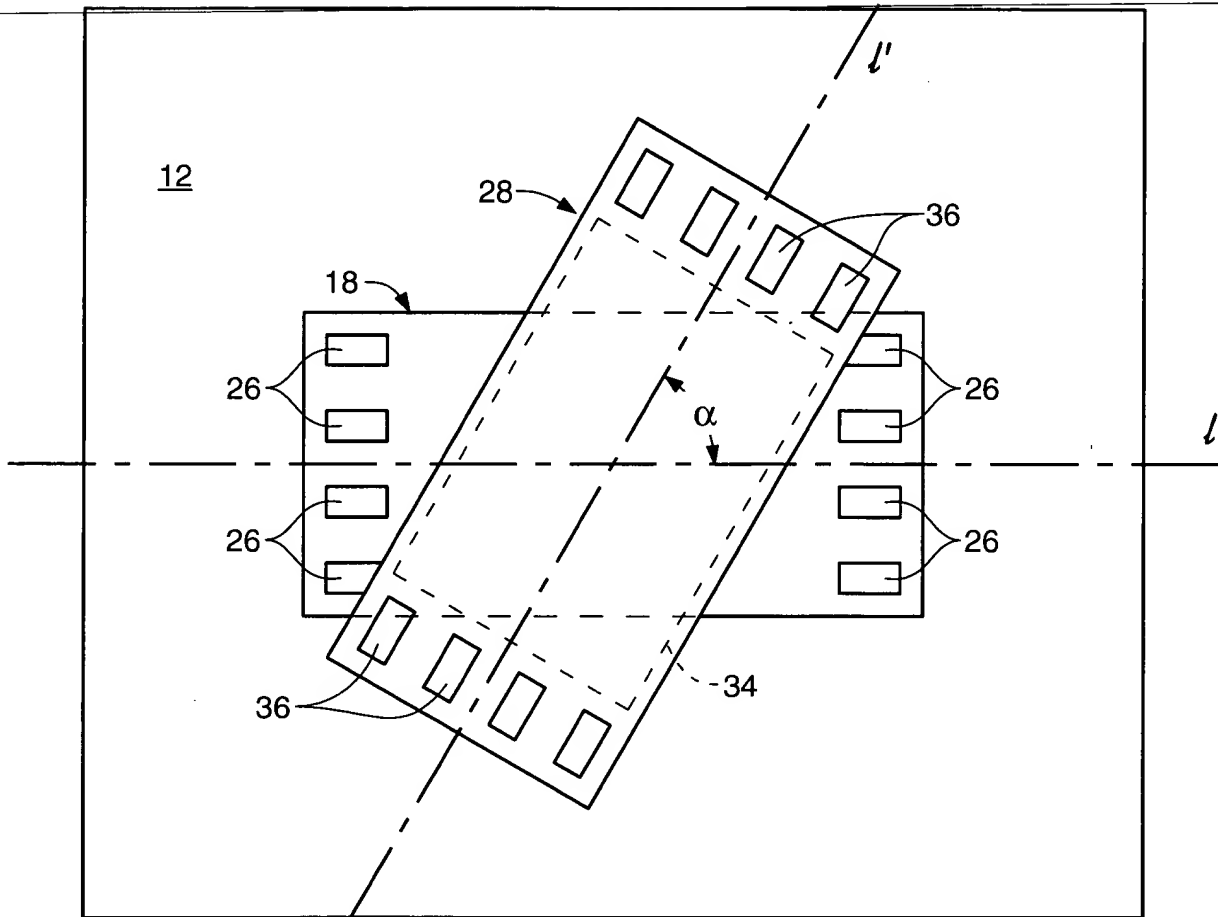


FIG. 5

Appendix 2

In re Vickers 141 F.2d 522, 61 U.S.P.Q. 122 (C.C.P.A. 1944)

Appellant in his reasons of appeal did not specifically allege error against the reliance by the board on the "Endotherm" reference because of its late date, and for this reason that reference must be considered here for what it is worth. In re Davis et al., 29 C.P.A. (Patents) 723, 123 F.2d 651, 51 USPQ 458.

Appellant was not required to file his notice of appeal as early as September 4, 1942 in view of the amendment to rule 149 which took effect on September 1, 1941, published at 6 F. R. 3923 and 529 O.G. 509, which provides that "if a petition for rehearing or reconsideration is filed within 20 calendar days after said decision, the notice of appeal may be given and the reasons of appeal filed within 15 calendar days after action on the petition."

Appellant concedes that it is old as shown in the prior art of record to utilize high-frequency energy for diathermy treatment. We are unable to see, however, that any of the prior art provides for a method of treatment whereby the fields in which the subject to be treated is placed are resonant within a closed chamber at a frequency characteristic of the chamber. None of the references disclosed an apparatus providing for a closed or substantially closed resonant chamber.

The only reference in the cited art showing an enclosure which may surround a patient is the Esau patent. There the subject is placed within a circular metal screen which may be of homogeneous metal or a plurality of parallel wires, open at the top. The screening is not connected with the electrical circuit and the patient is treated by means of plates situated opposite each other covering the portion of the body to be treated. It is stated in the patent that instead of the electric alternating field just described the magnetic alternating field can be used. That

magnetic alternating field, however, comprises the surrounding of the part to be treated with a coil not touching the part or the coil being in proximity to such part. It is obvious that such fields as have been described can be used simultaneously or separately. It is also stated in the patent that the reason for enclosing the body subjected to the short wave field with a metal screening is to avoid the loss of energy caused by sparking phenomenon at the electrodes, causing temperature increases in persons stationed near the patient of as much as 1° in an hour as the result of the displacement currents caused by the sparks. Therefore it is clear that the enclosure disclosed by the Esau patent is for a shield only and is intended to divert radiation so that it flows out of the ends of the wires of the shield, and likewise protect those who might be near the patient. The device of the Esau patent in our opinion does not anticipate the device defined by the claims, for the reason that instead of implying resonance in the shield the latter is not even part of the circuit. It appears to us that appellant's entire invention hinges on the maintenance of resonance within a chamber at its natural frequency characteristic, and we find nothing in the references which would make it obvious to one skilled in the art to construct the apparatus or use the method of appellant.

For the reasons heretofore stated the decision of the Board of Appeals is reversed.

31 C.C.P.A. (Patents) 985

Court of Customs and Patent Appeals

In re VICKERS AND HERMAN

Appl. No. 4836 Decided Mar. 6, 1944

PATENTS

1. Claims—Broad or narrow—In general

Patentability—Anticipation—In general

Pleading and practice in Patent Office

Assuming that Office can reject broad claim merely because it covers one or more inoperative species, Court of Customs and Patent Appeals deems it proper

to say that Board has repeated: that burden is on examiner to show claim covers inoperative species, and on applicant to show that it does.

2. Specification—Sufficiency of disclosure
—In general

In mechanical cases, broad claim be supported by single form of app disclosed in application; applican not disclose each specific embodin invention covered by claims.

Particular patents—Pumping A tus

Vickers and Herman, Oil Well
ing Apparatus, claims 4, 12, 20, 2
37 of application allowed.

Appeal from Board of Appeals
Patent Office.

Application for patent of Ha
Vickers and Kenneth R. Herman,
No. 281926. From decision re
claims 4, 12, 20, 21, and 37, ap
peal. Reversed.

BARNES, KISSELLE, LAUGHLIN &
(JOHN M. KISSELLE and ROB.
CHOATE of counsel), all of 1
Mich., for appellants.

W. W. COCHRAN (R. F. WHITE
counsel) for the Commission
Patents.

HATFIELD, Judge.

This is an appeal from the decision of the Board of Appeals of the United States Patent Office affirming the decision of the Primary Examiner rejecting claims 4, 12, 20, 21, and 37 in applicant's application for a patent for an invention relating to new and useful improvements in oil well pumping apparatus.

Seventeen claims were allowed
Primary Examiner.

Claim 4 is illustrative of the a
claims. It reads:

4. In combination, a cylinder containing an operating liquid reciprocal member in said cylinder means acting on said member assisting the entrance of liquid into said cylinder, a motor cylinder, a return member in said motor cylinder operable to be operably connected to the rod of a pump in a well, a pressure forming means, a pilot operating means adapted to control the direction of liquid under pressure through said pressure forming means and to and from said cylinders to supply of operating liquid, and a valve means connecting said

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ounding of the part to be
coil not touching the part
ing in proximity to such
ous that such fields as have
can be used simultane-
ately. It is also stated in
t the reason for enclosing
ted to the short wave field
screening is to avoid the
caused by sparking phe-
the electrodes, causing
ncreases in persons stae
patient of as much as
as the result of the dis-
ents caused by the sparks.
s clear that the enclosure
he Esau patent is for a
nd is intended to divert
at it flows out of the ends
f the shield, and likewise
who might be near the
device of the Esau patent
does not anticipate the
by the claims, for the
nstead of implying reso-
shield the latter is not
the circuit. It appears to
ellant's entire invention
maintenance of resonance
mber at its natural fre-
teristic, and we find noth-
erences which would make
one skilled in the art to
apparatus or use the
pellant.

sons heretofore stated the
e Board of Appeals is re-

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toms and Patent Appeals

ICKERS AND HERMAN

6 Decided Mar. 6, 1944

oad or narrow—In gen-

y—Anticipation—In gen-

nd practice in Patent Office

hat Office can reject broad
because it covers one or
ive species, Court of Cus-
nt Appeals deems it proper

to say that Board has repeatedly held
that burden is on examiner to show that
claim covers inoperative species, and not
on applicant to show that it does not.

2. Specification—Sufficiency of disclosure —In general

In mechanical cases, broad claims may
be supported by single form of apparatus
disclosed in application; applicant need
not disclose each specific embodiment of
invention covered by claims.

Particular patents—Pumping Appa- ratus

Vickers and Herman, Oil Well Pump-
ing Apparatus, claims 4, 12, 20, 21, and
37 of application allowed.

Appeal from Board of Appeals of the
Patent Office.

Application for patent of Harry F.
Vickers and Kenneth R. Herman, Serial
No. 281926. From decision rejecting
claims 4, 12, 20, 21, and 37, applicants
appeal. Reversed.

BARNES, KISSELLE, LAUGHLIN & RAISCH
(JOHN M. KISSELLE and ROBERT A.
CHOATE of counsel), all of Detroit,
Mich., for appellants.

W. W. COCHRAN (R. F. WHITEHEAD of
counsel) for the Commissioner of
Patents.

HATFIELD, Judge.

This is an appeal from the decision
of the Board of Appeals of the United
States Patent Office affirming the deci-
sion of the Primary Examiner rejecting
claims 4, 12, 20, 21, and 37 in appellant's
application for a patent for an alleged
invention relating to new and useful im-
provements in oil well pumping appa-
ratus.

Seventeen claims were allowed by the
Primary Examiner.

Claim 4 is illustrative of the appealed
claims. It reads:

4. In combination, a cylinder for
containing an operating liquid, a
reciprocal member in said cylinder,
means acting on said member for re-
sisting the entrance of liquid to said
cylinder, a motor cylinder, a reciprocal
member in said motor cylinder adapted
to be operably connected to the sucker
rod of a pump in a well, a pressure
forming means, a pilot operated shift-
able means adapted to control the di-
rection of liquid under pressure
through said pressure forming means
and to and from said cylinders, a sup-
ply of operating liquid, unidirectional
valve means connecting said supply

with the inlet of said pressure forming
means, valve means responsive to
movement of one of said reciprocal
members for directing pressure to said
pilot operated means to shift the same,
and additional valve means responsive
to abnormal movement of one of said
reciprocal members resulting in closure
of the outlet port of one of said
cylinders adapted to delay the shifting
of said pilot operated means, and
thereby cause a replenishing of liquid
from said supply to said system during
said delay.

The claims were rejected by the
tribunals of the Patent Office on the
ground that they are broader than ap-
pellants' invention. They were not re-
jected on prior art.

There being no prior art involved, it
is unnecessary that a detailed explana-
tion of appellants' apparatus be here set
forth. However, the Primary Examiner
described appellants' apparatus quite
fully in his statement to the Board of
Appeals.

Appellants' apparatus includes a so-
called "well operating or work cylinder"
and piston, an accumulator cylinder and
piston, and a pump which forces liquid
from one cylinder to the other under
control of a directional valve. The ap-
paratus also includes two pilot valves.
One, controlled by the accumulator pis-
ton, causes normal reversal shifting of
the directional valve, and the other, by
abnormal movement of the work cylinder
piston which closes a port in the lower
part of the work cylinder, delays normal
reversal for replenishment purposes.
(Replenishment is required because of
leakage in the system.) Thus it will be
seen that appellants' apparatus is an
automatic system for reversal of a closed
system and replenishment of liquid in
the system.

It will be observed from what has
been said that in appellants' apparatus
one of the pilot valves is caused to op-
erate by the accumulator piston, and the
other by the work cylinder piston. The
accumulator piston and the work cylinder
piston move substantially in unison. Ac-
cordingly, the idea of actuating the
valves in accordance with piston move-
ment is obviously a unitary conception,
and the operation of the system would
be the same regardless of whether the
accumulator piston or the work cylinder
piston operates one or the other of those
valves, provided the valves are operated
for the purposes hereinbefore set forth.

In the apparatus defined by the ap-
pealed claims, the pilot valves may be

operated by the two pistons, as hereinbefore described, or they may be operated by a single piston.

The language of claim 4 which calls broadly for the operation of the valves either by a single piston or by two pistons is as follows:

valve means responsive to movement of *one* of said reciprocal members for directing pressure to said pilot operated means to shift the same, and additional valve means responsive to abnormal movement of *one* of said reciprocal members resulting in closure of the outlet port of *one* of said cylinders adapted to delay the shifting of said pilot operated means, and thereby cause a replenishing of liquid from said supply to said system during said delay. (Italics not quoted.)

In his statement to the Board of Appeals, the Primary Examiner said that, although the appealed claims read on appellants' disclosure, they were "incomplete" in that they omitted "a limitation without which" they were "broader than the disclosed invention," that is to say, they were sufficiently broad to call for the operation of the valves by a single piston. The examiner stated, however, that he would allow claims which defined the arrangement of the apparatus wherein "one piston by its movement controls the application of pilot pressure, while the other piston by its movement closes the inlet port of its cylinder to delay reversal." We quote from the examiner's statement as follows:

The claims on appeal, however, are even broader * * * in that they merely state that *one* piston controls pilot pressure, and *one* piston delays reversal by causing closure of the outlet port of *one* cylinder. This language is broad enough to cover a construction wherein a single piston controls the pilot pressure and its own or the other cylinder's inlet port to also delay reversal. Whether it is possible to construct such a structure wherein a single piston performs all these functions, the Examiner cannot say. For present purposes, it seems sufficient to state that it is not immediately clear how it can be done, and applicants have not shown how to do it. Under such circumstances, it is believed proper to require applicants to reasonably restrict their claims to cover their own structure and obvious modifications thereof, while still leaving the field of improvement open to him who subsequently teaches the public how all the functions are to be performed by

the motion of only one of the two moving pistons.

Applicants have argued that it is possible that all reversing and delay functions could be performed by motion of one piston, and that to require them to limit the claims to recite that the control is under the motion of both pistons, would unduly limit their protection.

The answer to this is that if such a structure is possible, and is part of the invention disclosed in this case, applicants should have described it, if they desired to claim it. Having failed to describe it, and it is not being apparent how it can be brought about, it must be held to be outside the scope of the invention described herein, and applicants are not entitled to protection on it. (Italics quoted.)

In its decision affirming the decision of the Primary Examiner, the Board of Appeals called attention to the language in the body of claim 4, hereinbefore specifically referred to, and stated that the wording of the claim was confusing when read on the drawings in appellants' application; that appellants have not shown a construction, either in their drawings or in their specification, wherein a single piston might control the valves for the desired purposes; and that an entirely different and unobvious construction from that shown in appellants' drawings and specification would be necessary in order to control the valves by a single piston. The board further said:

The construction shown [in appellants' specification and drawings] requires two cylinders, the piston in [one] operating one valve means and the piston in the other operating the other valve means. * * *

We are cognizant of the fact that in a mechanical case an applicant may generally draw a broad claim on a single construction. However, it should be obvious to any one skilled in the art to make such modifications covered. That is not the situation here.

It is contended here by counsel for appellants that the gist of the involved invention—

lies mainly in the particular valve arrangement for controlling reversal automatically and for permitting replenishment. It is not new to shift valves by extension of piston rods in this very art. We believe it plainly follows from this that it actually is obvious how the system could be

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argued that it is reversing and delay performed by mo- and that to require claims to recite that the motion of both ly limit their pro-

is is that if such a , and is part of the in this case, appli- described it, if they Having failed to is not being appar- brought about, it outside the scope of cribed herein, and entitled to protec- s quoted.)

arming the decision niner, the Board of ion to the language im 4, hereinbefore to, and stated that claim was confusing wings in appellants' ppeallants have not on, either in their their specification, ston might control sired purposes; and erent and unobvious hat shown in ap- and specification in order to control e piston. The board

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changed to have both valves * * * controlled by a single piston rather than by both of them.

In explanation of how the apparatus might be arranged so that the valves would be properly controlled by a single piston, counsel for appellants state in their brief that it would seem to be obvious that the pilot valve, which is shown in appellants' specification and drawings as being controlled by the accumulator piston for causing normal reversal of the directional valve, might be operated by a projection from the piston in the work cylinder, or, instead of the port at the lower end of the work cylinder being closed by the work cylinder piston, it could be closed by a mechanical connection to the piston rod of the accumulator piston. Counsel's main contention is, however, that the "obviousness of various modifications [of the disclosure in appellants' specification] need not concern" the tribunals of the Patent Office; that it is the duty of those tribunals "to see that the claims are directed to novel and patentable subject matter," and that they are "readable on the disclosure." Counsel also contend that "To require an applicant to limit his claims to all obvious modifications, would either prevent him from receiving fair protection from his idea or it would cause him to multiply the disclosures of his patent to all the possible modifications that he could foresee in order that he could get broad claims," and that appellants are entitled to claims which cover "all devices which carry the spirit of the invention and are not shown by the prior art."

In support of their contentions, counsel for appellants rely upon the decisions in the following cases: In re Matzner, 20 C. C. P. A. (Patents) 799, 62 F.2d 190 [16 USPQ 25]; Ex parte Louis N. D. Williams, 2 USPQ 93; Ex parte Vickers, 53 USPQ 607.

In the Matzner case, supra, the invention involved related to radio receivers, and, among other things, disclosed means for "giving an electrical indication when the dial controlling the movable member of the condenser is in position to tune the receiver for a particular station." Claim 2, there involved, called for a dial for radio receiving sets, an electrical indicator, arranged in a normally open circuit and adapted to be rendered active only when the dial was set to tune in a station, and a circuit closing means, including a plurality of contact members "carried by the dial and disposed in circuit closing position only when the dial

is set to tune in a station." The Board of Appeals allowed certain claims, which, instead of calling for "contact members," called for "contact pins." In reversing the board as to certain of the claims there on appeal, we said [16 USPQ 27]:

We are of the opinion that the references do not show or suggest the useful result secured by appellant, *either by the use of contact pins or in any other manner*, and we therefore hold that appellant should not be restricted to the use of contact pins, but that he is entitled to a broader protection irrespective of whether the lamp circuit is closed by means of contact pins. (Italics not quoted.)

In the Williams case, supra, the Board of Appeals, in reversing the decision of the Primary Examiner rejecting the claims there on appeal, quoted from the decision in the case of Ex parte Weaver, 1897 C. D. 165, wherein the Commissioner of Patents said [2 USPQ at 96]:

It is the well-settled policy of this Office, however, to allow applicants to claim their invention as broadly as possible in view of the state of the art.

In the case of Ex parte Vickers, supra, the Board of Appeals, in reversing the decision of the Primary Examiner rejecting the single claim there on appeal, stated that the examiner had not rejected the claim on prior art, but had rejected it on the ground that it was broader than the applicant's disclosure because it was so drawn that it covered structures not specifically disclosed or described in the applicant's application. The board further stated [53 USPQ at 608]:

As a general rule an applicant in a mechanical case seldom shows more than one embodiment. He is generally allowed claims, when the art permits, *which cover more than the specific embodiment shown. That practice is so general that it occurs in almost every case.* * * *

Even though the present applicant has not disclosed more than one specific arrangement of the controlling valve, we see no good reason why applicant should be denied a claim that will cover other arrangements as long as the claimed invention is novel. *The examiner has not shown that any other arrangement cannot be employed and obtain the equivalent result. It is our view that the claim is not too broadly drawn and that it should be allowed.* (Italics ours.)

The Solicitor for the Patent Office states in his brief that it is too well settled to require citation of authorities that "ordinarily in a mechanical case broad claims may be supported by a disclosure of a single form of the apparatus disclosed in an application." The solicitor contends, however, that the general rule as stated is not applicable to a claim which necessarily covers an apparatus working on a principle entirely different from that shown and described in an application, which apparatus is not suggested in the application and is not obvious from the disclosure therein. In support of those views, the solicitor cites the case of *Excelsior Drum Works v. Sheip & Vandegrift*, 173 F. 312, wherein it was stated by the District Court for the Eastern District of Pennsylvania that a broad claim could not be based upon a disclosure that was specifically limited to a single device which was not given as an example or as a preferred structure. It was also the view of the solicitor that it is not obvious from appellants' specification and drawings how appellants' apparatus might be reorganized so as to operate the valves by the movement of a single piston.

We are unable to concur in the view of the solicitor that appellants' specification does not suggest that the pilot valve for effecting normal reversal of the directional valve and the other pilot valve, which is so actuated as to delay normal reversal of the directional valve for replenishment purposes, could be operated by a single piston.

We quote from appellants' specification:

An object of the present invention is to provide a mechanism which is responsive to the movement of a reciprocal member in the *pumping cylinder or the accumulator cylinder or both* which will permit the operating liquid to be taken by the pressure forming means from an independent supply and injected into the closed system to replenish the supply of operating liquid. This replenishing apparatus is intended to operate automatically and is responsive to the quantity of liquid in the system. (Italics ours.)

It is apparent from the quoted excerpt that the accumulator piston may be used not only to effect normal reversal of the directional valve, but also to delay the operation of that valve for the purpose of replenishing the system. Accordingly, it is plainly suggested in appellants' specification that the accumulator piston

alone may operate the valves for the purposes set forth in the appealed claims.

Section 4888 of the Revised Statutes (U. S. C. title 35, sec. 33) requires an applicant to explain the principle of his invention and "the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions."

In construing that section, the Supreme Court of the United States in the case of *Continental Paper Bag Company v. Eastern Paper Bag Company*, 210 U. S. 405, 418, stated:

An inventor must describe what he conceives to be the best mode, but he is not confined to that. *If this were not so most patents would be of little worth.* "The principle of the invention is a unit, and invariably the modes of its embodiment in a concrete invention may be numerous and in appearance very different from each other." *Robinson on Patents*, Sec. 485. (Italics not quoted.)

That case, together with other decisions to the same effect, was cited and quoted from in the case of *In re Lester Kirschbraun*, 18 C. C. P. A. (Patents) 735, 44 F.2d 675 [7 USPQ 132].

In the instant case, appellants have described what they considered to be the best mode of operation of their apparatus and also an alternative mode of operation.

It will be recalled that the Primary Examiner held that the appealed claims read on appellants' disclosure, which they obviously do. The claims were not rejected because they cover all means of producing the desired result, or because of prior art. Nor were they rejected by the examiner because they cover an inoperative structure. Accordingly, it is unnecessary for us to discuss the question raised by counsel for appellants as to whether the tribunals of the Patent Office have authority to reject a broad claim merely because it may cover one or more inoperative species.

[1] Assuming, however, without deciding, that they have such authority, we deem it not improper to say that the Board of Appeals has repeatedly held that the burden is upon the Primary Examiner to show that such a claim covers an inoperative species, and not upon the applicant to show that it does not. See *Ex parte Riszdorfer*, 34 USPQ 338; *Ex parte Johnson*, 40 USPQ 576; *Ex parte Lilienfeld*, 44 USPQ 174; *Ex parte Korpium*, 50 USPQ 224; *Ex parte Vickers*, supra. See also rules 65, 66, and 135

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31 C.C.P. Court o

Appl. N PATEN 1. Inter In in plicants

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of the Rules of Practice in the United States Patent Office.

In his statement to the Board of Appeals, the examiner stated that appellants had not disclosed how a single piston could operate the valves; that it was not immediately clear to him how such an apparatus could operate; and that appellants had failed to describe such a structure in their application.

In other words, as we understand the examiner's decision, he held the claims to be too broad because the applicants did not disclose in their application each specific embodiment of the invention covered by the appealed claims. That holding was affirmed by the Board of Appeals.

Obviously, the decision of the Board of Appeals, as well as that of the Primary Examiner, is not in accordance with the rule as stated in the solicitor's brief, that is, "that ordinarily in a mechanical case broad claims may be supported by a disclosure of a single form of the apparatus disclosed in an application." Nor is the board's decision in conformity with the statement contained therein that "in a mechanical case an applicant may generally draw a broad claim on a single construction."

[2] In mechanical cases, such as that here involved, broad claims may be supported by a single form of the apparatus disclosed in an applicant's application. See *In re Lester Kirschbraun*, supra, and cases therein cited; Ex parte Kleinknecht, 49 USPQ 680; Ex parte Vickers, supra.

For the reasons stated, we are of opinion that the appealed claims were improperly rejected. Accordingly, the decision of the Board of Appeals is reversed.

31 C.C.P.A. (Patents) 979

Court of Customs and Patent Appeals

KOCH v. LIEBER

Appl. No. 4793 Decided Mar. 6, 1944

PATENTS

I. Interference—Burden of proof

In interference between reissue applicants whose original applications were

copending, party second to file original and reissue is junior and must establish priority by preponderance of evidence.

2. Appeals to Court of Customs and Patent Appeals—Issues to be determined—Patent interferences

Interference—Dissolution

Primary examiner denied party's motion to dissolve interference and granted opponent's motion to add count; at final hearing, Board of Interference Examiners held that additional reasons not included in party's motion to dissolve or in his opposition to addition of count could not be considered by it; such holding was in conformity with Rule 122; on appeal, Court may consider only reasons in motion to dissolve and opposition to motion to add count.

3. Appeals to Court of Customs and Patent Appeals—Issues to be determined—Patent interferences

Where appellate tribunal of Patent Office (in instant case, Board of Interference Examiners) contrues counts broadly and holds that when so construed they are patentable over art, Court is bound by holding; patentability of such counts is for ex parte consideration by Patent Office.

4. Interference—Reduction to practice—Tests

Hearing aid device is not properly tested by holding it in position by hand rather than by head band.

Particular patents—Audiphone

2077425, Lieber, Bone Conduction Hearing-Aid, reissue application awarded priority against application for reissue of 2144458, Koch, Bone Conduction Audiphone.

Appeal from Board of Interference Examiners of the Patent Office.

Patent interference No. 77992 between Hugh Lieber, deceased, application, Serial No. 267932, filed April 14, 1939, for reissue of Patent No. 2077425 issued April 20, 1937 on application filed Dec. 24, 1932, and Henry Koch, application, Serial No. 314564, filed Jan. 18, 1940, for reissue of Patent No. 2144458 issued Jan. 17, 1939 on application filed Aug. 31, 1935. From decision awarding priority to senior party, junior party appeals. Affirmed.

HOGUET, NEARY & CAMPBELL (WALTER H. FREE and GEORGE H. COREY of counsel), all of New York, N. Y., for appellant.

S. MICHAEL PINELES (M. C. MASSIE of

Appendix 3

Spectra-Physics, Inc. v. Coherent, Inc., 827 F.2d 1524, 3 U.S.P.Q.2d 1737 (Fed. Cir. 1987),
cert. denied, 484 U.S. 954 (1987).

er, and ends on page 76. Plaintiff John Tenniel from page 77 to page 84 of the same chapter. There is distinctive about such a structure of work. The plan for the entire work is as yet uncompleted, is also uncompleted. It appears that plaintiff is the development of illustration in the present. Again, such a presentation, structured chronologically, is copyrightable.

Structure of "Treasury" is Not Really Similar to the Structure of "The Pictured World"

Plaintiff's finding above that plaintiff is entitled to copyright protection for the structure of "The Pictured World" is, in the Court's view, also incorrect. The Court also finds that no fact finder could determine that the structure of "Treasury," and that its chapters, is similar to that of "The Pictured World." Unlike plaintiff's chapters of "Treasury" are organized by theme or school, the Court notes that each chapter of "Treasury" is organized in the most basic of literary formats. Each chapter begins with a short summary of the life of the illustrator in the context of the social climate of his or her time. Each chapter turns to the life of the illustrator in a standard chronological sequence. For example, in the chapter of Walter Crane, the chapter discusses the illustrator's childhood, his important relationship with his mother, his important relationship with his father, and the artist's later work. The chapter culminates with a summary of the artist's accomplishments. The structure of plaintiff's work, "The Pictured World" — even if copyrightable — is not similar to that of "Treasury."

Plaintiff's Selection and Presentation of Facts Contained within "The Pictured World" are not Copyrightable — The Copyright Act of 1976, 17 U.S.C. § 102, and the law of this Circuit, do not secure a copyright in the selection of materials and the marshalling of facts contained in a factual compilation.

101 defines a "compilation" as

work created by the collection and assembling of pre-existing materials or of data that are arranged, organized, or arranged in such a way that the resulting work as a whole constitutes an original work of authorship.

101.

See, e.g., *Eckes v. Card Prices Update*, 736 F.2d 859 [222 USPQ 762] (2d Cir. 1984) and *Financial Information, supra*, 751 F.2d 501, 506 [224 USPQ 632, 636]. In *Eckes*, the Second Circuit, focusing on the language of the Copyright Act, "selected, coordinated, or arranged," upheld the copyrightability of a baseball card guide referring to 18,000 or so different baseball cards because the authors exercised "selection creativity and judgment" in choosing 5,000 of them as "premium cards." The Court of Appeals noted that:

[W]e have been particularly restrictive in the protection of non-fiction works indicating, for example, that the fruits of another's labor in lieu of independent research obtained through the sweat of a researcher's brow, does not merit copyright protection absent, perhaps, wholesale appropriation

Nevertheless, our cases do not hold that subjective selection and arrangement of information does not merit protection.

736 F.2d at 862 [222 USPQ at 764]. Moreover, in *Financial Information*, the Second Circuit — while remanding to the trial court the inquiry of whether an aggregation of financial data constituted a copyrightable compilation — held that the "questions to be addressed will include whether the data used on [plaintiff's] cards involved a modicum of selection, coordination, or arrangement on [plaintiff's] part, sufficient to meet the rather broad copyrightability standard of originality which is phrased in terms of 'independent creation' rather than the narrower, inapplicable standards of 'uniqueness' or 'novelty' or 'ingenuity,' [citations omitted]." 751 F.2d at 507 [224 USPQ 636-637].

Plaintiff argues broadly that these cases support his copyright claim because

defendants took the selection and ordering of the facts in [plaintiff's] work, including the many quotations that plaintiff found from original sources which [defendants] appropriated. [Plaintiff] does not own a copyright in any individual fact or quote, but he does own a copyright in their collection together. If [defendants] appropriated that collection — which [plaintiff] assert[s] and defendants do not challenge here — than [sic] the overall claim of infringement [sic] on the individual passages is greatly enhanced.

P. Memo. at 47-48.

Plaintiff's reliance on *Eckes* and *Financial Information* as support for the aforementioned argument is misplaced. Those cases involved compilations of raw data — similar to directories or lists. The question asked by

the courts was whether this aggregation of pure data involved such selectivity on the part of the compiler to constitute originality. In the instant case, plaintiff's works are not compilations of data. Instead they are works of historical and artistic interpretation more properly analyzed under the approach formulated in *Hoehling, supra*, 618 F.2d 972 [205 USPQ at 681]. Accordingly, plaintiff's claim based on the "compilation" theory is also dismissed.

CONCLUSION

For the aforementioned reasons, defendants' motion for summary judgment seeking the dismissal of plaintiff's complaint is granted. Plaintiff's cross-motion is denied. Accordingly, plaintiff's complaint is dismissed in its entirety.

SO ORDERED.

Court of Appeals, Federal Circuit

Spectra-Physics Inc. v. Coherent Inc.

Nos. 86-1114 and 86-1133

Decided August 17, 1987

JUDICIAL PRACTICE AND PROCEDURE

1. Procedure — Jury trials (§410.42)

Issue of whether patentee adequately disclosed best mode of carrying out invention, which was not decided by jury due to incorrect jury interrogatories, was properly decided by court; since, under Fed.R.Civ.P. 49(a), defendant's failure to object to incorrect interrogatories caused defendant to effectively waive right to jury trial on best mode issue, and thus court's findings as to best mode are reviewed under "clearly erroneous" standard of Fed.R.Civ.P. 52(a), rather than as denial of motion for judgment n.o.v. under Fed.R.Civ.P. 50(b).

PATENTS

2. Patentability/validity — Adequacy of disclosure (§115.11)

Patent construction — Specification and drawings — In general (§125.1101)

Patent specifications which listed "TiCu-Sil" brazing, moly-manganese brazing, and low-temperature pulse-soldering as means of attaching copper cups to inside of ceramic tube in construction of ion laser were ade-

quate to satisfy enablement requirements of 35 USC 112, since disclosure of alternative methods would enable one skilled in art to make and use claimed inventions, but did not satisfy "best mode" requirements of Section 112, since specifications did not disclose six-stage TiCuSi brazing cycle developed by inventors and known to inventors as best means of attaching copper cups to ceramic tube.

Particular patents — Lasers

4,376,328, Mefferd, Method of Constructing a Gaseous Laser, holding of invalidity affirmed.

4,378,600, Hobart, Gas Laser, holding of invalidity affirmed.

Appeal from District Court for the Northern District of California, Ingram, J.

Action by Spectra-Physics Inc. for declaratory judgment stating invalidity and non-infringement of patents, and counterclaim by Coherent Inc. for patent infringement. From decision holding patents invalid, parties cross-appeal. Affirmed, on separate grounds; Archer, Circuit Judge, concurring in part with opinion.

Karl A. Limbach and Limbach, Limbach & Sutton, San Francisco, Calif., for appellant Coherent Inc. (J. William Wigert, Jr., Michael A. Stallman and Limbach, Limbach & Sutton, San Francisco, Calif., of Counsel.)

James W. Geriak and Lyon & Lyon, Los Angeles, Calif. (John M. Benassi, James H. Shalek, David B. Ritchie, Paul H. Meier and Lyon & Lyon, Los Angeles, Calif., with them on the brief) for appellee Spectra-Physics Inc.

Before Skelton, Senior Circuit Judge, and Rich and Archer, Circuit Judges

Rich, Circuit Judge.

These are cross-appeals from the December 16, 1985, judgment of the United States District Court for the Northern District of California holding both of Coherent's patents in suit, No. 4,378,600 entitled "Gas Laser" issued on March 29, 1983, to James L. Hobart (the Hobart patent) and No. 4,376,328 entitled "Method of Constructing Gaseous Laser" issued on March 15, 1983, to Wayne S. Mefferd (the Mefferd patent), invalid for lack of enabling disclosure under 35 USC 112, first paragraph, after originally

entering judgment on a jury verdict finding claims 2, 5, 7, and 18 of the Hobart patent and claim 10 of the Mefferd patent valid and infringed by Spectra-Physics, Inc. (Spectra).

We reverse the district court's holding that both patents are invalid for lack of enablement. We also reverse, however, the court's finding that both patent specifications complied with the best mode requirement of §112, and thus affirm the judgment that the patents are invalid, but on a different legal ground.

Before discussing the legal aspects of this case, we first explain the technology involved which gave rise to them.

Background

A. Ion Lasers — In General

The Hobart patent is directed to an ion laser structure and the Mefferd patent to a method of fabricating an ion laser. "Laser" is an acronym for *light amplification by stimulated emission of radiation*.¹ An ion laser is a type of gaseous laser. The lasing medium, typically argon or krypton gas, is contained within a sealed discharge tube which is axially aligned with a pair of mirrors to form the optical cavity or resonator.

For lasing to take place, the argon or krypton gas must be excited to elevated energy states. This is accomplished by providing a high-energy electrical discharge through the gas. The discharge through the laser must then be constrained to a straight line along the laser's optical path and pinched to a small diameter to concentrate its energy into a small elongated volume.

The discharge through the laser is extremely hot — up to 6000°C. The exterior of the laser, however, must operate at room temperature, requiring dissipation of large amounts of heat by external cooling. It is also important that gas pressure be uniformly controlled along the discharge tube. For some reason, not entirely agreed upon by physicists, the gas tends to move to one end of the tube or the other. This phenomenon, known as "pumping," causes an uneven gas pressure differential in the discharge tube, resulting in poor performance or no performance at all.

¹ Webster's Unabridged Third New International Dictionary, which further defines laser as "a device that utilizes the natural oscillations of atoms for amplifying or generating electromagnetic waves in the region of the spectrum from the ultraviolet to the far-infrared including the visible region."

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Background

Lasers — In General

patent is directed to an ion and the Mefferd patent to a lasing an ion laser. "Laser" is for light amplification by emission of radiation.¹ An ion of gaseous laser. The lasing is by argon or krypton gas, is in a sealed discharge tube aligned with a pair of mirrors, optical cavity or resonator. To take place, the argon or krypton is excited to elevated energy levels. This is accomplished by providing an electrical discharge through the gas. The discharge through the laser is constrained to a straight line optical path and pinched to a small volume to concentrate its energy in a small volume.

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B. Hobart

The Hobart patent is directed to a gas laser having an improved laser discharge tube.² The discharge path of the laser is determined by coaxially aligned apertures in a series of spaced-apart tungsten discs within the laser discharge tube. The discharge tube itself is a thin-walled ceramic tube, for example, of alumina (Al_2O_3). Heat from the tung-

sten discs is transmitted by conduction to and through the ceramic tube (26), which is surrounded by a water jacket, by copper cups (50) attached to the inside of the tube. See Fig. 1 below, which is a dissected sectional view showing two end portions with a substantial portion of the central section omitted, the broken line representing the longitudinal axis.

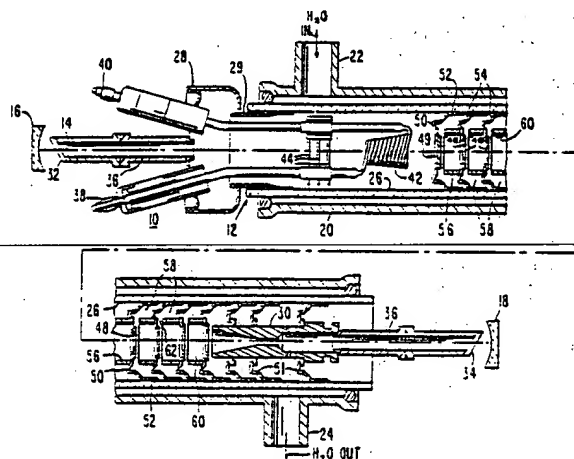


Figure 1.
Cross-sectional View of Laser Structure

Claim 1 calls for "means for providing a heat conduction path from the central aperture of each of said discs to and through the tube wall." This includes both means for attaching the tungsten discs (48) to the center opening of each copper cup and means for

attaching the cups to the inside wall of the ceramic tube. High thermal conductivity is achieved by brazing or soldering which provides a permanent metallic contact between the cups and the tube wall.

The Hobart patent further discloses and claims a "shield" feature which is a cylindrical ring coaxially attached to or formed integrally with each of the copper cups.³ These shields (56) aid in minimizing gas pumping within the discharge tube.

C. Mefferd

The Mefferd patent describes a method of fabricating the laser structure of the Hobart patent.⁴ The problem addressed in the Mef-

³ Claim 2 of the Hobart patent reads:

2. A laser as in claim 1 wherein each of said cup-shaped members includes a cylindrical ring gas barrier which is coaxially aligned with the central aperture and which extends within the volume of a cup-shaped member.

⁴ Claim 1 of the Mefferd patent reads:

1. A method of fabricating a gaseous laser discharge tube comprising:
assembling [sic] a plurality of spaced-apart heat-conducting members, each having a discharge defining central aperture generally aligned with the tube axis, within and in contact with an electrically-insulating tube;

² Claim 1 of the Hobart patent reads:

1. A laser comprising:
a gas-confining cylindrical tube made of a relatively thin-walled, electrically-insulating material;
a plurality of spaced-apart discs within and generally perpendicular to the axis of said tube, each having a central aperture co-axially aligned with the axis of said tube to define a central discharge path;
a plurality of cup-shaped members of a material having high thermal conductivity, each having a generally flat face and a generally cylindrical rim, and each having an opening in the middle of the face;
means for providing a heat conduction path from the central aperture of each of said discs to and through the tube wall comprising means for attaching a disc at the periphery [sic, periphery] of the opening of each of the cup members and means for attaching the distal edge of each of the cup rims along the inside wall of said tube;
means for exciting a gas within said tube; and
an optical cavity aligned with said tube.

ferd patent is how to insert and hold in place the heat conducting cups inside the long, slender tube, while at the same time maintaining the apertured discs in precise alignment. The patent discloses a "floating" disc technique whereby the disc apertures are aligned by tensioning a mandrel that has been passed through each of the disc apertures. Once the disc apertures are aligned, the whole assembly is brazed to permanently bond the parts within and to the tube walls. See Fig. 12 below in which the copper cups are 50, the shields 56, the discs 48, the mandrel 74 and the ceramic tube 26. The figure shows a partial assembly before the brazing of the discs to the cups, which is done in a vertical position with end "B" upward.

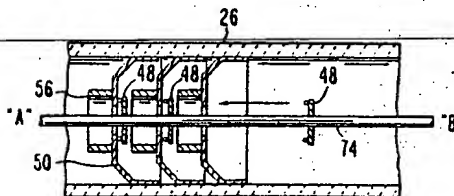


Figure 12.
Cross-sectional View Illustrating Assembly
of Cups and Discs Within Discharge Tube

D. The Importance of Brazing

Both the Hobart and Mefferd patents stress the importance of the bond between the copper cups and the ceramic tube. Poor thermal contact between them results in higher disc temperatures which in turn impedes the gas flow through the tube. For the laser to be reliable, the copper-ceramic bond must also be able to withstand repeated heat cycling. Due to the differing rates of thermal expansion of copper and alumina, the bond is subject to compressive forces as the laser heats up and tensile stress during cooling.

Dr. Hobart initially approached the problem of how to make the critical copper to ceramic bond by experimenting with soldering. These attempts were unsuccessful and no attempt was made to even try to solder together any laser shaped parts. Wayne Mefferd was then brought in to solve the attachment problem. His solution was brazing.

While the patent specifications disclose pulse soldering as one method of attachment, brazing is clearly the preferred method. In

tensioning a mandrel provided through the central aperture to bring the central apertures into exact alignment; and permanently securing the heat-conducting members to the electrically-insulating tube.

this process, a brazing shim 68, Fig. 4, is placed between the copper cup 50 and the inner wall of the ceramic tube 26, see Fig. 3, and the whole assembly is heated to the melting point of the braze material.

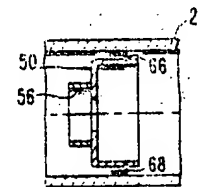


Figure 3.

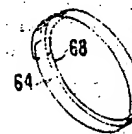


Figure 4.

During heating the cup is mechanically expanded into contact with the tube by means of an expansion tool inserted into tube 26.

The patents further disclose "TiCuSil" as the preferred brazing material. This material is a copper silver eutectic (an alloy whose ingredients are proportioned to have the lowest possible melting point) with a small percentage of titanium added for making a ceramic to metal seal under what is known as the active metal process. In this process, the titanium invades and wets the ceramic so that the copper-silver braze material can hold the copper to the ceramic. In the absence of an active metal alloy component such as titanium, the ceramic must be pre-metalized with, for example, molybdenum (MoMn), to provide a metallic surface to which the copper-silver braze material will adhere.

The TiCuSil active metal process is preferred because it requires only one step and avoids the need for premetalization. In addition, the copper cups cannot be electrically connected because this destroys the evenly graduated electrical potential down the bore of the tube which is required for the laser to operate. Thus, any premetalization must be in circular stripes along the inner surface of the tube so that each copper cup can be brazed or soldered to a different stripe.

E. Patentee Coherent's Six-Stage Braze Cycle

According to the standard product specification sheet, TiCuSil should be brazed at 850°C. The sheet also specifies that the braze should be performed in a vacuum or in a neutral atmosphere of dry argon gas. Using these general guidelines, Mefferd developed a six-stage braze cycle for using TiCuSil to attach the copper cups to the ceramic tube. "Braze cycle" is a term of art which refers to a process defined by specific parameters of temperature, length of times at given temperatures, atmosphere, and pressure.

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brazing shim 68, Fig. 4, is the copper cup 50 and the ceramic tube 26, see Fig. 3, assembly is heated to the braze material.

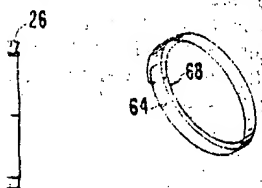


Figure 4.

The cup is mechanically exact with the tube by means of a shim inserted into tube 26. The shim is a "TiCuSil" brazing material. This material is a eutectic (an alloy whose composition is proportioned to have the lowest melting point) with a small amount of silver added for making a seal under what is known as the process. In this process, the shim wets the ceramic so the silver braze material can flow into the ceramic. In the above metal alloy component, the ceramic must be pre-prepared. For example, molybdenum-silver braze material will

active metal process is pre-prepared. It requires only one step and no premetalization. In addition, the cups cannot be electrically pre-prepared. This destroys the evenness of the potential down the bore. A pre-metalization is required for the laser to be pre-metalized must be along the inner surface of each copper cup can be brazed to a different stripe.

Coherent's Six-Stage Braze Cycle

The standard product specification for TiCuSil should be brazed at 850°C. It also specifies that the brazing is performed in a vacuum or in a flow of dry argon gas. Using these guidelines, Mefferd developed a six-stage cycle for using TiCuSil to braze the cups to the ceramic tube. The term of art which refers to the six-stage cycle by specific parameters of time, temperature, and pressure.

Mefferd knew that there were tradeoffs in the braze cycle. For one, it is generally desirable to heat the parts as fast as possible. As the parts are heated, however, "outgassing" occurs and contaminants trapped in the parts are released into the atmosphere of the oven. The vacuum pump removes the outgassed contaminants, but if the outgassing is too rapid, then the pressure may rise and the pump will not work. Also, if oxygen is evolved as part of the out-gas, the titanium may react with it and degrade the strength of the braze joint.

In assessing the tradeoffs, Mefferd let the pressure control the braze cycle, as one experimental approach. For example, Mefferd held the pressure in the oven at 10^{-4} torr while the assembly was initially heated from 0 to 750°C. This took from an hour and a half to two hours. In the next step, he held the temperature at 750°C for ten to fifteen minutes while further reducing the pressure. The temperature was then increased for a period of approximately fifteen minutes until it reached 850°C. The remaining steps include holding the temperature at 850°C for a specified time and at a pressure of 10^{-4} torr, decreasing the oven temperature to 750°C and adding argon gas, and then turning the oven off.

Mefferd's six-stage cycle produced a reliable braze joint between the copper cups and the ceramic tube. Because this approach worked, Coherent continued to use TiCuSil and never investigated the molybdenum-silver process or further experimented with soldering. Neither the Hobart patent nor the Mefferd patent, however, discloses the braze cycle or any additional information on brazing copper to ceramic using TiCuSil.

F. Spectra's "Cold Disc" Lasers

Dave Wright, head of research at Spectra, and his technician Martin Riley, worked on so-called "cold disc" lasers of the type in suit in the late 1970's. They referred to these lasers as "cold disc" lasers because the process of brazing the copper cups to the ceramic tube provided good thermal conduction as contrasted with the earlier radiatively-cooled lasers which ran hot. Wright and Riley, however, had only limited success with cold disc lasers, in part because they could not make a satisfactory bond between the copper cups and the alumina ceramic tube. Upon repeated heat cycling, the ceramic would crack and cause the copper to break away, overheat, and melt, which destroyed the operation of the tube. After two and a half years, Wright was unable to make a TiCuSil braze joint which was reliable enough for a

commercially acceptable product and Spectra temporarily abandoned the project.

Spectra resumed work on the cold disc project in 1981 after Coherent introduced its INNOVA laser embodying the inventions of the patents in suit. Because of their uncertainty about brazing, Spectra hired a brazing expert, Dr. Leonard Reed, to develop a molybdenum-silver process for attaching the cups to the ceramic tube. After nearly a year of experimentation, Dr. Reed developed Spectra's proprietary molybdenum-silver process. This involved using precision ceramic tubing and a special computerized striping tool which ground circular rings away from a coat of molybdenum-silver metallization painted on the entire inside of the tube.

Spectra eventually introduced its Model 2020 gas laser which was made using the molybdenum-silver process. Like Coherent's laser, each of the copper cups in the 2020 laser has a ring or shield to alleviate the gas pumping problem.

The Decision Below

Spectra brought a declaratory judgment action against Coherent asking a holding of invalidity and non-infringement of both patents. Coherent counterclaimed for infringement and an adjudication of validity.

After thirty-two days of trial, the district court submitted eighteen "Interrogatories to the Jury" and the jury answered fifteen of them, finding in part that Spectra's model 2020 laser infringed claims 2, 5, 7, and 18 of the Hobart patent and claim 10 of the Mefferd patent (the shield claims). The jury found that the remaining claims of both patents were invalid for obviousness or were anticipated by the work done by Wright and Riley at Spectra. The jury also found, however, that Wright and Riley had not reduced their cold disc laser to practice before conception of the subject matter set forth in the Hobart and Mefferd patents.

After entering judgment on the jury verdict, the district court withdrew the judgment and asked the parties to prepare proposed findings of fact and conclusions of law on several additional issues including disclosure of best mode and enablement under §112, co-inventorship of the shield claims by Dr. Rempel, another Coherent employee, and inequitable conduct. The court ruled in favor of Coherent on all of these issues except enablement. On that issue, the court held both patents invalid for failure to disclose the six-stage braze cycle used by Coherent to manufacture the laser. The court found that the best mode requirement was satisfied, however, because neither Hobart

nor Mefferd deliberately or accidentally concealed brazing as the best mode of attaching the copper cups to the ceramic tube.

Coherent appeals from the judgment with respect to lack of enablement and seeks reinstatement of the jury verdict that the shield claims are valid and infringed by Spectra. Coherent also appeals the portion of the judgment finding the remaining (non-shield) claims invalid for obviousness because of an erroneous jury instruction and requests a remand for a new trial on these claims.

Spectra cross-appeals from the judgment as it relates to best mode, inventorship of the shield claims, and derivation of the claimed subject matter from Wright and Riley. Spectra also appeals the denial of its request for attorney fees.

OPINION

1. Introduction — Adequate Disclosure Under §112, 1st Paragraph.

To constitute adequate disclosure under the first paragraph of 35 USC 112, a patent specification must set forth both the manner and process of making and using the invention (the enablement requirement) and the best mode contemplated by the inventor of carrying out the invention (the best mode requirement). The difference between these two is explained in *In re Gay*, 309 F.2d 769, 135 USPQ 311 (CCPA 1962):

The essence of [the enablement requirement] is that a specification shall disclose an invention in such a manner as will enable one skilled in the art to make and utilize it. *Separate and distinct* from [enablement] is [the best mode requirement], the essence of which requires the inventor to disclose the best mode *contemplated by him*, as of the time he executes the application, of carrying out his invention. Manifestly, the sole purpose of this latter requirement is to restrain inventors from applying for patents while at the same time concealing from the public preferred embodiments of their inventions which they have in fact conceived.

... The question of whether an inventor has or has not disclosed what he feels is his best mode is, however, a question separate and distinct from the question of the *sufficiency* of his disclosure to satisfy the requirements of [enablement].

Id. at 772, 135 USPQ at 315. [emphasis in original].

Thus, compliance with the best mode requirement focuses on a different matter than does compliance with the enablement requirement. Enablement looks to placing the

subject matter of the claims generally in the possession of the public. If, however, the applicant develops specific instrumentalities or techniques which are recognized at the time of filing as the best way of carrying out the invention, then the best mode requirement imposes an obligation to disclose that information to the public as well. *See Flick-Reedy Corp. v. Hydro-Line Mfg. Co.*, 351 F.2d 546, 550-51, 146 USPQ 694, 697 (7th Cir. 1965), *cert. denied*, 383 U.S. 958 [148 USPQ 771] (1966); *Union Carbide Corp. v. Borg Warner Corp.*, 550 F.2d 355, 361-63, 193 USPQ 1, 6-7 (6th Cir. 1977).

The situation before us is one in which the patent specifications disclose more than one means for making the claimed invention, but do not adequately disclose the best means actually known to the inventors. The district court recognized that the specifications were inadequate under §112, but incorrectly based its decision on a lack of enablement. As we explain, the problem is really one of best mode, and thus, while we disagree with the district court's views on these issues, the judgment that the patents are both invalid was correct and must be sustained.

2. Enablement

a. The Jury Question

Before addressing the substance of the district court's decision on enablement, we consider the question, raised by Coherent, whether the court was free to decide enablement at all without first considering the jury verdict. While no specific question was submitted to the jury on enablement, the district court instructed the jury that "invalid claims cannot be infringed" and provided general instructions on the law of enablement. Coherent maintains that by finding the shield claims infringed, the jury implicitly decided enablement in its favor, and that the court could not overrule these findings without making the determinations required by JNOV.

The district court, however, did not feel constrained by the jury verdict because it considered the question of enablement to be one of law. The court also viewed the form of the verdict as a special verdict under Rule 49(a), Fed. R. Civ. P., and not as a general verdict.

Although enablement is ultimately a question of law, *see, e.g., Moleculon Research Corp. v. CBS, Inc.*, 793 F.2d 1261, 1268, 229 USPQ 805, 810 (Fed. Cir. 1986), *cert. denied*, 107 S. Ct. 875 (1987); this court has recognized that there may be underlying factual issues involved, *see Quaker City Gear Works, Inc. v. Skil Corp.*, 747 F.2d

1446, 145 Cir. 1984 (1985). T such as e. 49(a), but subsequent plicit and Because t the substa we need n the jury's

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2. Enablement The Jury Question

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1446, 1453-54, 223 USPQ 1161, 1166 (Fed. Cir. 1984), *cert. denied*, 471 U.S. 1136 (1985). The court may submit legal issues such as enablement to the jury under Rule 49(a), but if it does, the court may not make subsequent findings which overrule an implicit and inherent finding of the jury. *Id.* Because the district court erred in applying the substantive law of enablement, however, we need not decide whether it also overruled the jury's finding.

b. Enablement By Alternative Means

To be enabling under §112, a patent specification must disclose sufficient information to enable those skilled in the art to make and use the claimed invention. See, e.g., *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384, 231 USPQ 81, 94 (Fed. Cir. 1986), *cert. denied*, 107 S. Ct. 1606 (1987). The district court held both of the patents in suit invalid for lack of enablement based on their failure to disclose Coherent's six-stage braze cycle for brazing TiCuSil. The court found that the braze cycle was "necessary to the enjoyment of the invention [sic]."

Coherent's braze cycle, however, is applicable only to TiCuSil brazing, which is just one of the ways to make and use the claimed inventions. The Hobart patent calls for "means for attaching" the copper cups to the inside of the ceramic tube and Mefferd has essentially the same step of "permanently securing" the cups to the tube. The specifications identify as suitable attachment techniques the alternatives of TiCuSil brazing, moly-manganese brazing, and low-temperature pulse-soldering.

If an invention pertains to an art where the results are predictable, e.g., mechanical as opposed to chemical arts, a broad claim can be enabled by disclosure of a single embodiment. *In re Cook*, 439 F.2d 730, 735, 169 USPQ 298, 301 [CCPA 1971]; *In re Vickers*, 141 F.2d 522, 527, 61 USPQ 122, 127 [CCPA 1944], and is not invalid for lack of enablement simply because it reads on another embodiment of the invention which is inadequately disclosed, see *Gould v. Mos-singhoff*, 711 F.2d 396, 400, 219 USPQ 393, 396 [D.C. Cir. 1983].³ Thus, it is sufficient here with respect to enablement that the patents disclose at least one attachment

means which would enable a person of ordinary skill in the art to make and use the claimed inventions. Because the patents disclose the alternatives of moly-manganese brazing and pulse-soldering, their failure to also disclose Coherent's TiCuSil braze cycle is not fatal to enablement under §112.

Spectra argues that the patents' references to the "moly-manganese process" is only in regard to low-temperature pulse-soldering, not brazing. We disagree. A fair reading of that paragraph as part of the general discussion of brazing, given that moly-manganese brazing was the most common method of bonding metal to ceramic, is that one skilled in the art would recognize that moly-manganese brazing was an alternative means of attachment. Spectra's Dave Wright, among others, testified that moly-manganese brazing was common in the industry and was well-known for brazing copper to ceramic.

The district court ignored the moly-manganese process, however, for the erroneous reason that it was "neither described nor advocated in the patents in suit." A patent need not teach, and preferably omits, what is well known in the art. *Hybritech*, 802 F.2d at 1384, 231 USPQ at 94. While there is no elaboration of moly-manganese brazing in the patent specifications, the district court found that brazing was an old and well-known technique when the applications were filed.

Spectra argues that moly-manganese brazing suitable for use in constructing the lasers of the two patents was not enabled because it required undue experimentation as evidenced by the amount of time and money it spent developing its moly-manganese process. Spectra's efforts, however, were not simply directed to finding a moly-manganese process that would work, but encompassed a whole range of enterprises necessary to making a commercially successful product. In fact, it took only three months from the time Spectra decided on a specific design for its laser until it established a workable braze technique, but it was almost another year before it made its first truly successful prototype laser.

The two major problems that Spectra claims it had to solve in order to have a successful moly-manganese process also do not show lack of enablement. For example, Spectra contends that the moly-manganese process requires the use of precision ceramic tubing, something not taught in the patent. But Steve Jarrett, charged with developing Spectra's braze process, stated that the reason he used precision tubing was to save labor costs. Likewise, Spectra claims that

³ This is also the logical implication of having a separate best mode requirement under §112 which contemplates that the specification can enable one to make and use the invention and still not disclose a single preferred embodiment.

Dr. Reed had to develop a special computerized striping tool to grind away circular rings from the coat of moly-manganese metallization painted on the inside of the tube. A Spectra in-house report reveals, however, that stripe metallized tubes were available from the same vendors that made the ceramic tubes themselves.

As for the court's statement that moly-manganese was not "advocated" in the patents, this is another matter entirely. We can only surmise that the court somehow confused the enablement requirement with the best mode.⁶ Nonenablement is the failure to disclose *any* mode. *In re Glass*, 492 F.2d 1228, 1233, 181 USPQ 31, 35 (CCPA 1974), and does not depend on the applicant advocating a particular embodiment or method for making the invention. In practical terms, where only an alternative embodiment is enabled, the disclosure of the best mode may be inadequate. But that is a question separate and distinct from the question whether the specification enabled one to make the invention at all. *In re Gay*, 309 F.2d at 772, 135 USPQ at 315.

Finally, there is no mention at all of low-temperature pulse-soldering, except to the extent that the court considered it to be the same as the "moly-manganese process." Spectra asserts that pulse-soldering could not be used in the method claimed in the Mefferd patent because it permits soldering of only one cup at a time. This may be true, but it says nothing about making the structure claimed in the Hobart patent. At the very least, the court should have considered whether it was an operative alternative for making the Hobart structure.

3. Best Mode

a. The Jury Question (Again)

Coherent raises the same question with respect to best mode that we found unnecessary to decide for enablement, that is, whether the jury implicitly found that the patents disclosed the best mode. Because the district court also found for Coherent on best mode, it would seem unnecessary to decide the jury question in this context as well. It is relevant,

⁶ One indication that the district court probably confused the concepts of enablement and best mode is the cases cited by the court in its conclusions on enablement, *Dale Electronics Inc. v. RCL Electronics, Inc.*, 488 F.2d 382, 180 USPQ 225 (1st Cir. 1973), and *Union Carbide Corp. v. Borg Warner Corp.*, 550 F.2d 355, 193 USPQ 1 (6th Cir. 1977), which deal primarily with best mode, not enablement, under §112.

however, as far as it affects the proper standard of review in this court and so we must address it.

The parties clearly intended the jury to decide best mode. The interrogatories submitted to the jury, however, failed to carry out that intent. Interrogatory 14 read as follows:

14. Did Coherent disclose the best mode known to it at the time the patent application was filed?

Yes _____ No _____

The question came back unanswered because the preamble to the question instructed the jury to consider best mode only if it had answered the preceding interrogatory on obviousness "no." The jury answered that question "yes" — but only for certain claims. The preamble to interrogatory 14 should have instructed the jury to answer best mode if the answer to obviousness was "no" or "yes as to less than all claims."

This is the type of inadvertent omission that Rule 49(a), Fed. R. Civ. P., remedies by providing that trial by jury has been effectively waived in these circumstances. See *Quaker City Gear Works, Inc. v. Skil Corp.*, 747 F.2d 1446, 1453, 223 USPQ 1161, 1165 (Fed. Cir. 1984), *cert. denied*, 471 U.S. 1136 (1985) (right to trial by jury of factual issue may be waived by agreeing to instructions that jury need not answer all questions); see also 5A Moore's Federal Practice ¶ 49.03[4] (1986). Coherent's failure to object to the form of the interrogatories caused the best mode issue, by operation of Rule 49(a), to revert to the court for decision. See *Quaker City*, 747 F.2d at 1453, 223 USPQ at 1166. Thus, we review the district court's findings on best mode under the "clearly erroneous" standard of Rule 52(a), Fed. R. Civ. P., and not, as Coherent's argument suggests, as if the lower court's ruling was a denial of a motion for JNOV under Rule 50(b).

The single instruction to the jury that invalid claims cannot be infringed (a nonsense statement), one of many on supposed general principles of patent law, does not operate to convert the interrogatories on infringement into general verdicts which subsumed all of Spectra's invalidity defenses, including best mode. Any inference that the jury implicitly found that the best mode requirement was satisfied is negated by the preamble to interrogatory 14 which in effect told the jury that it need not consider the best mode.

b. Adequate Disclosure of Best Mode

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Disclosure of Best Mode

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plated by the inventor," there is no objective
standard by which to judge the adequacy of a
best mode disclosure. *DeGeorge v. Bernier*,
768 F.2d 1318, 1324, 226 USPQ 758, 763
(Fed. Cir. 1985). Instead, only evidence of
"concealment," whether accidental or inten-
tional, is considered. *Id.* The specificity of
disclosure required to comply with the best
mode requirement must be determined by
the knowledge of facts within the possession
of the inventor at the time of filing the
application. See *United States Dep't of En-
ergy v. Daugherty*, 687 F.2d 438, 446, 215
USPQ 4, 11 (CCPA 1982).

Compliance with the best mode require-
ment, because it depends on the applicant's
state of mind, is a question of fact subject to
the clearly erroneous standard of review. See
McGill, Inc. v. John Zink Co., 736 F.2d 666,
676, 221 USPQ 944, 951 (Fed. Cir.), *cert.*
denied, 469 U.S. 1037 (1984). This assumes,
however, a proper legal understanding of the
best mode requirement, which we find miss-
ing from the district court's analysis. In gen-
eral, we do not disagree with the facts as
found by the district court. It is only the
court's ultimate conclusion that the best
mode requirement was satisfied that we
reject.

In analyzing compliance with the best
mode requirement, the district court focused
only on the generic rather than the specific
information known to the inventors and
found that neither Mefferd nor Hobart in-
tentionally, deliberately, or accidentally
"concealed the braze technique as the best
mode of attaching the heat web to the alumina
tube." (Findings of Fact 4 and 8.) The
patent specifications make clear, however,
that the best mode contemplated by the
inventors, as least as far as the critical
"means for attaching" the copper cups to the
ceramic tube is concerned, was more than
just brazing in general — it was TiCuSil
active metal brazing. Coherent acknowl-
edges as much by its references to TiCuSil as
the "preferred" brazing material and by the
fact that Coherent never used anything else.

The appropriate question then is not
whether the inventors disclosed TiCuSil
brazing at all — they did — but whether
TiCuSil brazing was adequately disclosed.
See *In re Sherwood*, 613 F.2d 809, 816, 204
USPQ 537, 544 (CCPA 1980), *cert. denied*,
450 U.S. 994 [210 USPQ 776] (1981). Even
though there may be a general reference to
the best mode, the quality of the disclosure
may be so poor as to effectively result in
concealment. *Id.*

The facts found by the district court, when
placed in the proper framework, plainly dem-
onstrate that the TiCuSil brazing technique

used by Coherent was not adequately dis-
closed. The court stated in findings of fact
under the heading "ENABLEMENT":

2. The use to which Coherent put the
TiCuSil braze material was, and was
known to be by Coherent at the time,
contrary to criteria for the use of TiCuSil
as contained in the literature.

and again,

9. The references to brazing as used in the
patents and the extraneous texts (Kohl,
Wesgo Brochure) relied upon by Coher-
ent, do not describe for the benefit of one
skilled in the art of laser construction the
manner in which the Mefferd method is
usable for the construction of the Hobart
apparatus by means of [TiCuSil] brazing.
The district court also found that the inven-
tors were aware of the problems associated
with TiCuSil:

4. The known difficulty recognized by Ho-
bart and Mefferd in working with TiCuSil
as a braze material for the purpose to
which they put it is reflected in Hobart's
disclosure dated March 1, 1979 . . . that
the titanium-copper-silver process is "not
in high favor in the ceramic industry" and
"not preferred as compared with what is
called the moly-manganese technique
which produces stronger and also less leak-
prone seals" and essentially the same lan-
guage in the May, 1979 patent disclosure
signed by all of Hobart, Mefferd and
Johnston.

Coherent admits that its braze cycle is not
disclosed in either patent nor is it contained
in the prior art. Instead, it maintains that its
braze cycle is unique to its ovens, and be-
cause the performance of industrial ovens
varies considerably, the actual parameters
would be meaningless to someone who used a
different oven. In support of its position,
Coherent cites *In re Gay*, 309 F.2d at 769,
135 USPQ at 316, which states that "[n]ot
every last detail is to be described, else pat-
ent specifications would turn into production
specifications, which they were never meant
to be." In doing so, however, Coherent was
not discussing whether it had complied with
the best mode requirement because the court
had held in its favor on that issue; it was
discussing whether it had complied with the
enablement requirement on which the court
had held against it.

First, it is not up to the courts to decide
how an inventor should disclose the best
mode, but *whether* he has done so adequately
under the statute. *Weil v. Fritz*, 601 F.2d
551, 555, 202 USPQ 447, 450 (CCPA
1979). Second, far from being a "production
specification," Coherent did not disclose any
details about its brazing process. It is this

complete lack of detail which effectively resulted in its concealment.

Where the district court went wrong on the law while reaching the right result is starkly revealed in its conclusions of law. Under the heading of "BEST MODE" is this conclusion:

4. There was no concealment deliberate or otherwise by Hobart or Mefferd of the brazing process as the best mode of bonding the heating web to the alumina tube. As we have pointed out, however, this refers to brazing in general, not the actual brazing cycle with TiCuSil and all of the parameters which Coherent found to be its best mode, admittedly not disclosed. In contrast, but under the heading "ENABLEMENT," is the key conclusion of law which supports our conclusion and the judgment, reading as follows:

3. The six stage braze cycle employed by Coherent, and developed by it, are [sic, is] necessary to the enjoyment of the invention taught by the patents in suit by a person skilled in the art of laser construction, and are [sic] not sufficiently disclosed by the patents in suit. [Original emphasis.]

For reasons above explained, Coherent's failure to disclose its "six-stage braze cycle" fully supports the defense of non-compliance with the best mode requirement of the first paragraph of §112, although the inventions as broadly claimed could be practiced without knowledge of it, which means that the patent specifications are enabling. The trial court evidently had a grasp on the essential facts but somehow got them into the wrong legal pigeonholes. With the aid of lawyers, this is not difficult to do.

Spectra's claim in this declaratory judgment complaint that the two patents in suit are invalid must therefore be sustained on the ground that they fail to disclose the best mode contemplated by the inventors for practicing their respective inventions. 35 USC 112 and 282.

4. Attorney Fees

The primary basis for Spectra's request for attorney fees is Coherent's supposedly bad faith conduct during litigation, specifically the manipulation and suppression of evidence. While bad faith conduct during litigation may make a case exceptional under 35 USC 285, see, e.g., *Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 455, 227 USPQ 293, 298 (Fed. Cir. 1985), judgments of a district court concerning good and bad faith are not easily overturned. *Western Marine Electronics v. Furuno Elec. Co.*, 764

F.2d 840, 847, 226 USPQ 334, 339 (Fed. Cir. 1985).

Spectra lists alleged abuses by Coherent, all presented to the court below and found unconvincing. Spectra has not shown that the court's implicit determination that this was not an exceptional case was erroneous or that the court abused its discretion by denying Spectra its attorney fees. See *Reactive Metals Alloys Corp. v. ESM, Inc.*, 769 F.2d 1578, 1582-83, 226 USPQ 821, 824 (Fed. Cir. 1985). Furthermore, we see no need to remand as in *S.C. Johnson & Sons Inc. v. Carter-Wallace, Inc.*, 781 F.2d 198, 201, 228 USPQ 367, 369 (Fed. Cir. 1986), where the court's reasons can be readily inferred from the record and arguments made below.

5. Other Issues

Because we affirm the judgment that the Hobart and Mefferd patents are invalid, we need not decide the other issues presented by Coherent's appeal and Spectra's cross-appeal, namely, those relating to the jury instruction on obviousness, inventorship of the shield claims, and derivation from Wright and Riley.

CONCLUSION

The judgment of the district court that the Hobart and Mefferd patents are both invalid is affirmed but on a different ground than that relied on by the court below. We hold that both patents are invalid under §112, first paragraph, for failure to disclose the best mode, not for lack of enablement as the district court held.

The district court's denial of Spectra's request for attorney fees is affirmed.

AFFIRMED

Archer, Circuit Judge, concurring.

I join the opinion of the majority, except that I find no basis for the majority's comment regarding the "aid of [the] lawyers." The record on appeal does not indicate that the lawyers misled the court or otherwise affirmatively contributed to the court's error regarding enablement and best mode which, whether or not intended, seems to be the implication of the comment.

Appendix 4

Ex parte Wolters, 214 U.S.P.Q. 735 (Pat. & Tr. Office Bd. App. 1979).

statement was due and a time ptember 3, 1979, when motions nus, Hill was required to *first* oofs to prepare his preliminary der 37 C.F.R. 1.216 and then e to file any motions he thought nder 37 C.F.R. 1.231, such as a end the issue" under 37 C.F.R. Hull has presented no reasons then unable to move to amend conform to his proofs, a rather procedure. *De Benneville v. CCPA* 891, 212 F.2d 612, 101 1954). It is noted that this is Rivise and Caesar, "Interference ictice", Michie Co., 1943, Vol. it page 914 in quoting Richard els Arising Out of Interference n the Patent Office", 21 JPOS 'S:

of the parties finds *** that ie count of the issue is disclosed ation, it is not supported by his ion to practice. Under such cir he will be well advised to file a amend to add a claim that is y such evidence. This *** is a *** to avoid losing subject

hin, "The Pitfall of Interference C.F.R. 1.231," 60 JPOS 579 er 1978).

ative argument of Hull as to a so untenable as we note that the l do not establish that the ring in ually constructed on behalf of fact formed by removing any ie collector region to form a en filling it with a second mate record pages 81, 82 only speaks n the oxide and base diffusion at record page 105, only speaks i portion of the oxide for intro base impurity. Chu, at record ks of a photo resist step where c is defined and then there is a ion, Togias, at record page 132, pattern across the face of the ie oxide layer is on the surface ffusion or deposition operation. imony only shows a removal of tern and diffusion of the boron the collector region where the ved; there is no testimony as to of collector region material to

over, the junior party has failed y evidence that such a trough idered to be a "groove" by those at counsel considers it to be one t for attorney argument does not npetent evidence. *Meitzner v. F.2d* 775, 193 USPQ 17, 22

(CCPA 1977); *Peeler v. Miller*, 535 F.2d 647, 190 USPQ 117, 123 (CCPA 1976); *Micheletti v. Tapia* 196 USPQ 858, 863 (BPI 1976). Words in a count are not to be given their ordinary meaning to a layman but rather are given their ordinary technical meaning in the particular art. *Jones v. Kuypers*, 42 CCPA 1095, 225 F.2d 485, 107 USPQ 9, 11 (1955).

Accordingly, priority of invention as to counts 1 and 2 is hereby awarded to Maurice Bonis, the senior party.

Patent and Trademark Office Board of Appeals

Ex parte Wolters and Kuypers

Opinion dated June 13, 1979

Patent No. 4,343,896 issued Aug. 10, 1982

PATENTS

1. Claims — Indefinite — In general (§20.551)

Rejection under 35 U.S.C. 112 of claims, to kit each part of which is interrelated with others, that are clear and precise and are completely understandable to those skilled in art is not sustained.

2. Specification — Claims as disclosure (§62.3)

Claims in application, as filed, constitute part of original disclosure.

3. Construction of specification and claims — By Specification and drawings — In general (§22.251)

Disclosure of application embraces not only what is expressly set forth in words or drawings, but what would be understood by persons skilled in art; those features that are well known are as if they were written out in patent.

4. Pleading and practice in Patent Office — Rejections (§54.7)

Burden of establishing prima facie case of obviousness falls upon examiner; therefore, evidence upon which examiner relies must clearly indicate that worker of routine skill in art would view claimed invention as being obvious, as meant by 35 U.S.C. 103.

5. Pleading and practice in Patent Office — Rejections (§54.7)

Examiner's burden of supporting his holding of unpatentability is not met by "assuming" presence of missing component.

6. Construction of specification and claims — Broad or narrow — In general (§22.101)

Construction of specification and claims — Introductory phrase (§22.55)

Examiner's concern over breadth of claims due to use of word "comprising" is no excuse for ignoring claim preamble; each limitation in claims must be given effect.

Particular patents — Test Pack

Wolters and Kuypers, Method for the Demonstration and Determination of an Antigen or Antibody, rejection of claims 10-13 reversed.

Appeal from Group 171.

Application for patent of Gerrit Wolters and Leonardus Paulus Clemens Kuypers, Serial No. 653,579, filed Jan. 29, 1976. From decision: rejections claims 10-13, applicants appeal (Appeal No. 372-05). Reversed.

Robert H. Falk and Francis W. Young, both of Asheville, N.C., and Charles A. Wendal, Arlington, Va., for appellants.

Before Merker and Katz, Examiners-in-Chief, and Pellman, Acting Examiner-in-Chief.

Pellman, Acting Examiner in Chief.

This is an appeal from the examiner's decision finally rejecting claims 10 through 13, remaining claims 1 through 9 having been allowed.

The subject matter on appeal involves: "a test pack" or kit for detecting and determining an antigen (claims 10 and 11) or an antibody (claims 12 and 13) in a fluid sample. Claim 10 is reproduced as follows to serve as a more detailed description:

10. A test pack for the detection and determination of an antigen in a fluid sample, comprising:

- a given amount of a first antibody against the antigen to be determined;
- a given amount of a labelled second antibody against said antigen, said second antibody being produced in a different animal species than the first antibody;

c. a given amount of an insolubilized antibody against said first antibody.

In his Answer, the examiner cites the following reference:

Prince et al., *The Lancet*, 1346-1350 (1973).

All of the claims stand rejected for failing to point out the invention with particularity (35 USC 112, second paragraph) and for being based upon an inadequate specification (35 USC 112, first paragraph). The examiner, in defense of his position as to the urged defect of the claims, asserts that the claim recitations are directed to "an assembly of reagents" having no physical cooperation amongst the various components. He then explains that "the assembly is not an integral structural unit."

Appellants respond to the examiner's arguments with the citation of issued patents having claims to kits, as precedent, and the citation of several decisions, including *In re Venezia*, 530 F.2d 956, 189 (CCPA 1976), for legal authority.

We have no doubt that the present claims comply with the statutory requirements of 35 USC 112. Attention is invited to the explanation provided by the court at page 151 of the decision in *In re Venezia*, supra:

"As we view these claims, they precisely define a group or 'kit' of interrelated parts. These interrelated parts may or may not be later assembled to form a completed connector. *** The claimed invention does include present structural limitations on each part, which structural limitations are defined by how the parts are to be interconnected in the final assembly; if assembled: ***"

[1] As with the kit in the *Venezia* case, each part of the test pack herein is interrelated with the others. We find the claims clear and precise. Since there appears to be no persuasive reason why the claims would not be completely understandable to those skilled in this art, the rejection will not be sustained.

With respect to the adequacy of appellants' specification, the examiner criticizes the absence of a "specific embodiment of the test pack claimed." Also, he questions how the reagents are packaged and inquires as to the physical forms in which they are provided. Rule 71(b), 37 CFR 1.71(b), is cited.

Appellants' arguments to this rejection appear in the reply brief and amendment under 37 CFR 1.193(b) and in the supplemental reply brief. In the amendment, appellants seek to add to the specification, language identical to that in the appealed claims.

[2,3] We shall not sustain this rejection. The claims in the application, as filed, constitute part of the original disclosure. In *re Myers*, 56 CCPA 1129, 410 F.2d 828, 161 USPQ 668. This would appear to be sufficient disclosure to describe the claimed test

packs. Although the physical characteristics are not identified, we do not view such omission as a breach of the statutory requirements. The disclosure of an application embraces not only what is expressly set forth in words or drawings, but what would be understood by persons skilled in the art. Those features that are well known are as if they were written out in the patent. In *re Folkers*, et al., 52 CCPA 1269, 344 F.2d 970, 145 USPQ 390. Manifestly, neither the particular type of package nor the physical state and quantity of the reagents constitutes the essence of the claimed invention. These are merely incidental features and their selection are well within the routine competency of one skilled in the field.

All of the claims also stand rejected for being unpatentable (35 USC 103) over the Prince et al. publication item. At page 4 of the Answer, the examiner asserts:

"No patentable invention is seen in collecting various reagents in Prince's laboratory and placing them in a portable container. In the section of this Answer designated 'Description of the Prince Reference' the various pertinent reagents are specifically referred to."

At pages 2-3 of the Answer, the examiner describes the Prince et al. teaching as follows:

"Prince teaches an immunoassay for hepatitis-B antigen (HBAG). In the section designated 'Materials and Methods,' Prince describes an HBAb-coated tube and a radioactive labeled version of the HBAb; these antibodies are derived from guinea pig sera. Prince also describes antibody materials present in his laboratory which are derived from rabbits — see bottom of column 1, page 1347. The presence in Prince's laboratory of antibodies from other vertebrate specie[sic] is assumed — see top of column 2, page 1349. Note that the Prince laboratory contains HBAG — column 1, page 1347, lines 49-53."

After carefully considering the Prince et al. disclosure in light of all the comments directed thereto, we do not find the examiner's position to be well taken. Accordingly, this rejection will not be sustained.

[4] The burden of establishing a prima facie case of obviousness falls upon the examiner. Therefore, the evidence upon which the examiner relies must clearly indicate that a worker of routine skill in this art would view the claimed invention as being obvious, as meant by 35 USC 103. It is our opinion that the examiner has failed to discharge his burden of presenting a case of prima facie obviousness.

[5] A particularly relevant disclosure of Prince et al. is set forth at page 1349. Here the authors refer to the "use of HBAb prepared in different species for bound and la-

belled reagent in a system (the tube). * seem to correct "b." and "a" example. He disclosure of i.e., an insol pig HBAb. porting his met by "assu ing compone

[6] More appreciate t breadth of t word compr ing the claim *** Each given effect. 184 USPQ

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so stand rejected for USC 103) over the item. At page 4 of or asserts:

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The presence in antibodies from other s assumed — see top 349. Note that the tains HBAG — col- es 49-53." ring the Prince et al. he comments direct- find the examiner's n. Accordingly, this ined.

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evant disclosure of at page 1349. Here "use of HBAB pre- s for bound and la-

belled reagents (e.g., chimpanzee¹²⁵ I-HBAB in a system with guineapig HBAB bound to the tube). * * * These two antibodies would seem to correspond to the recited components "b." and "a.", respectively of claim 10, for example. However, we are unable to find any disclosure or suggestion of component "c.", i.e., an insolubilized antibody against guinea-pig HBAB. The examiner's burden of supporting his holding of unpatentability is not met by "assuming" the presence of the missing component.

[6] Moreover, in any event, although we appreciate the examiner's concern over the breadth of the claims (due to the use of the word comprising), this is no excuse for ignoring the claim preamble, i.e., "[a] test pack. * * *" Each limitation in the claims must be given effect. In re Boe et al., 505 F.2d 1297, 184 USPQ 38 (CCPA 1974). On the record before us, we are convinced that the preamble constitutes a proper limitation and would not be interpreted by workers of routine skill in the art as embracing an established laboratory, such as that of Prince et al.

For the reasons discussed above, the examiner's decision rejecting claims 10-13 is reversed.

Reversed.

Patent and Trademark Office Trademark Trial and Appeal Board

An Evening at the Trotters, Inc.
v. A Nite at the Races, Inc.

Decided June 24, 1982

TRADEMARKS

1. Cancellation — Amending pleadings (§67.175)

Respondent that was denied fair notice with respect to alleged abandonment would be prejudiced by granting late motion to amend.

2. Pleading and practice in Patent Office — In general (§67.671)

TTAB is not proper forum in which to air claims of unfair competition, infringement, and/or passing off, because it has no jurisdiction to consider them.

3. Identity and similarity — Words — Similar (§67.4117)

"An Evening At The Trotters" and "A Nite At The Trotters" would be likely to cause confusion when used on similar entertainment services.

4. Defenses — Fraud (§30.05)

Specific fraudulent intent must be shown to establish fraud on Patent and Trademark Office; respondent's knowledge of petitioner's use of its mark would not render fraudulent his statement in application that no other person, firm, corporation, or association has right to use said mark in commerce, so long as respondent believed his rights were superior at time statement was made.

5. Acquisition of marks — Character and extent of use — In general (§67.0731)

Even token use made specifically for purpose of supporting application for registration is bona fide use under circumstances that illustrate continuing effort to create market for goods or services or to improve them to extent that they may be acceptable and even successful in existing market.

6. Acquisition of marks — Character and extent of use — In general (§67.0731)

Mere fact that initial effort to create market for one's goods or services was modest does not reduce that effort to token use which, in its usual form, involves single shipment made for purpose of laying foundation for application to register.

7. Acquisition of marks — Character and extent of use — In general (§67.031)

There is no such novel rule in trademark law as one that favors later successful user of mark over prior only modestly successful one.

Trademark cancellation No. 11,702 by An Evening at the Trotters, Inc., against A Nite at the Races, Inc., Registration No. 1,060,497, issued Mar. 1, 1977. Petition denied.

Weisman, Celler, Spett, Modlin, Wertheimer & Schlesinger, New York, N.Y., for An Evening at the Trotters, Inc.

Alan K. Roberts, and Posnack, Roberts, Cohen & Spicens, New York, N.Y., for A Nite at the Races, Inc.

Before Rice, Fruge', and Sams *, Members.

Fruge', Member.

* Mr. Sams is substituted for David Kera who retired from government service.

Appendix 5

Vitronics Corp. v. Conception Inc., 90 F.3d 1576, 39 U.S.P.Q.2d 1573 (Fed. Cir. 1996).

emption is appropriate. Just enrichment claim: t defendants were en- g other than their un- n of the copyrighted: ich is equivalent to the ublic performance pro- ht Act. Thus, the claim: e "extra element" re- mption.

e its unjust enrichment on, AMCC relies on the ion in *National Car v. Computer Assocs.* 426 [23 USPQ2d 1370] t: denied, 114 S.Ct. 176 e, Computer Associates "CA") asserted counter- each of contract, copy- ightment against Nation- tem, Inc. ("National") al had used copyrighted in violation of a license hth Circuit rejected Na- hat CA's unjust enrich- eempted under Section ws:

ct in noting that certain claims for unjust enrich- when based upon allega- ndant engaged in one of to the copyright holder do not read CA to allege, s unjustly enriched as a ul exercise of one of the § r, we read this allegation rther explanation of the nds to prove arising from ntract. ... [W]e read of unjust enrichment as it inartful, to allege that d from [third parties] would have received had ached their contract.

5. AMCC contends that 'C's [unjust enrichment] er Classic was unjustly air competition and tor- with AMCC's contract ertainment." Plaintiff's ing *National Car Rental*, at its unjust enrichment part of the damages it connection with its unfair rtious interference claims ssic." *Id.* at 24. If this is unjust enrichment claim ith its unfair competition- rence claims. Because the ed that AMCC's unfair rtious interference claims

are preempted by the Copyright Act, the unjust enrichment claim must also be dismissed.

CONCLUSION

For the reasons set forth above, AMCC's First, Second, Third, and Fourth Claims for Relief — breach of contract, tortious interference with contract, unfair competition, and unjust enrichment — are preempted by Section 301 of the Copyright Act. Accordingly, defendants' motion is granted and these claims are dismissed. This action shall proceed solely on the copyright infringement claims set forth in the Complaint's Fifth and Sixth Claims for Relief.

SO ORDERED.

U.S. Court of Appeals Federal Circuit

Vitronics Corp. v. Conceptronic Inc.

No. 96-1058

Decided July 25, 1996

PATENTS

1. Patent construction — Claims — Defin- ing terms (§125.1305)

Term "solder reflow temperature," as used in claim for method of reflow soldering electrical devices to printed circuit boards, must be construed to mean "peak reflow temperature" of solder rather than lower "liquidus temperature" of solder, since "peak reflow temperature" and "liquidus temperature" are given distinctly different meanings in specification, and since claim, in order to be consistent with specification and preferred embodiment described therein, must be construed such that "solder reflow temperature" means peak reflow temperature.

2. Patent construction — In general (§125.01)

Federal district court may rely on expert testimony and other extrinsic evidence, to help it understand underlying technology in patent case, but may rely on expert testimony concerning proper construction of disputed patent term only in rare event that patent documents, taken as whole, are insufficient to enable court to construe disputed term; even then, prior art documents and dictionaries are more reliable guides than opinion testimony on claim construction, which is no

more reliable than opinion testimony on stat- utory construction and should therefore be treated with utmost caution.

Particular patents — Electrical — Circuit boards

4,654,502, Furtek, method for reflow sol- dering of surface mounted devices to printed circuit boards, judgment of non-infringe- ment as matter of law reversed

Appeal from the U.S. District Court for the District of New Hampshire, Loughlin, J. Action by Vitronics Corp. against Conceptronic Inc. for patent infringement. From judgment as matter of law that plaintiff failed to prove infringement, plaintiff ap- peals. Reversed and remanded.

Related decision: 27 USPQ2d 1046.

James J. Foster, Lawrence M. Green, and Brett N. Dorny, of Wolf, Greenfield & Sacks, Boston, Mass., for plain- tiff-appellant.

Paul J. Hayes and Dean G. Bostock, of Weingarten, Schurgin, Gagnebin & Hayes, Boston, for defendant-appellee.

Before Michel and Lourie, circuit judges, and Friedman, senior circuit judge.

Michel, J.

Vitronics Corporation ("Vitronics") ap- peals the September 27, 1995 order of the United States District Court for the District of New Hampshire, Civil Action No. 91-696-L, entering judgment as a matter of law that Vitronics did not prove that Conceptronic, Inc. ("Conceptronic") infringed claim 1 of U.S. Patent No. 4,654,502 ("the '502 patent"). The appeal was submitted for decision after oral argument on May 8, 1996. Because we conclude that the specification of the '502 patent dictates a claim interpreta- tion in accordance with the plaintiff's pro- posed construction, and that, so construed, the '502 patent may have been infringed, we reverse the trial court's decision and remand for further proceedings.

BACKGROUND

The Patented Invention

Vitronics and Conceptronic both manu- facture ovens used in the production of print- ed circuit boards. The ovens are used to solder electrical devices (such as resistors,

capacitors and integrated circuits) to the boards. Several methods of soldering devices to boards have been developed; the '502 patent, assigned to Vitronics, is directed to one of those methods.

Specifically, the '502 patent is directed to a method for the reflow soldering of surface mounted devices to a printed circuit board in which the circuit board is moved by a conveyor through a multizone oven. In this process, a solder paste is placed on the circuit board and the devices to be soldered (with attached connectors) are placed on the paste. The circuit board is then placed on what is basically a conveyor belt running through an oven and passing through several different heating zones. In the final and hottest zone, the solder paste melts and forms a connection between the device and the circuit board. The boards remain in the last heating zone for only a short duration, allowing the solder to reach a temperature high enough to cause the solder to melt and reflow while maintaining the devices themselves below the solder reflow temperature. Due to this temperature differential, the solder flows up the device connectors to form a solid connection.

Claim 1 of the '502 patent, the only claim at issue in this appeal, reads as follows: (with added emphasis on the disputed terms):

1. A method for reflow soldering of surface mounted devices to a printed circuit board comprising:

moving a printed circuit board having solder and devices disposed on a surface thereof through a first zone and in close proximity to a first emitting surface of at least one non-focused infrared panel emitter, said first emitting surface being at a first panel temperature;

moving said board through a second zone and in close proximity to a second emitting surface of at least one nonfocused infrared panel emitter, said second emitting surface being at a second panel temperature lower than said first panel temperature; and

moving said board through a third zone and in close proximity to a third emitting surface of at least one nonfocused infrared panel emitter, said third emitting surface being at a third panel temperature higher than said second panel temperature, said third emitting surface heating said board and said solder to a *solder reflow temperature* for a period of time sufficient to cause said solder to reflow and solder said devices to said board while maintaining the temperature of said devices below said *solder reflow temperature*.

Proceedings Before the District Court

This action was brought on November 26, 1991 by Vitronics against Conceptronic for

infringement of both the '502 patent and U.S. Patent No. 4,833,301 ("the '301 patent"). At the time the suit was filed, Conceptronic was selling the "Mark series" line of ovens. Conceptronic later discontinued the Mark series and began selling the "HVC series" line of ovens. Prior to trial, the parties stipulated that every limitation of claim 1 of the '502 patent was met by the HVC series of ovens, except the limitation requiring the utilization of "nonfocused infrared panel emitters" and the limitation that the temperature of the devices must be maintained below the "solder reflow temperature."

Vitronics, by way of a request for a jury instruction, asked the court to construe the meaning of the "solder reflow temperature" limitation. The specific instruction sought by Vitronics was as follows:

In considering the question of whether the '502 method patent has been infringed by the Mark and HVC Series ovens, you have to decide whether, in use, those ovens maintain the temperature of the devices below the solder reflow temperature. The phrase "solder reflow temperature" in the '502 patent means the temperature reached by the solder during the period it is reflowing during the final stages of the soldering process, sometimes referred to as the "peak solder reflow temperature." It does not mean the "liquidus temperature," the temperature at which the solder first begins to melt. Thus, if the temperature of the devices stays below that of the solder, the '502 method patent is infringed by the Mark and HVC Series ovens.

Thus, Vitronics contended that, as used in the claim, solder reflow temperature means peak reflow temperature, i.e., a temperature approximately 20° C above the liquidus temperature, at which the solder is completely melted and moves freely. Conceptronic, on the other hand, contended that solder reflow temperature means 183° C, i.e., the liquidus temperature of a particular type of solder known as 63/37 (Sn/Pb) solder.

A jury returned a verdict of non-infringement of the '301 patent. Vitronics does not appeal that verdict.

Whether the Conceptronic ovens utilize nonfocused infrared panel emitters is not before this court.

The specification of the '502 patent describes three exemplary types of solder which can be used in the solder reflow process: — 60/40 (Sn/Pb), 63/37 (Sn/Pb) and 666/2 (Sn/Pb/Ag) — each of which, it indicates, has a liquidus temperature of about 190° C and a peak reflow temperature of about 210° to 218° C. At trial, the parties appear to have discussed only 63/37 (Sn/Pb) solder, which has a liquidus temperature of 183° C. However, the claims are not limited to

The district court, at which time it concluded reflow temperature to 183° C. Vitronics court was required matter of law in Vitronics had not infringement under of solder reflow followed.

Claim Construction Court

In spite of Vitronics jury instruction construction, the district court, in construing its claim, considered the evidence put forth and in their brief support of their positions, the parties' depositions, expert testimony, and technical writings of Vitronics technical references are discussed.

The Patent Specification

Vitronics relied on itself to support its position. Although Vitronics' term "solder reflow" is ambiguous when argued that the temperature means rather than the liquidus temperature, Vitronics' specification that embodiment:

A preferred embodiment for reflow soldering of surface mounted devices to printed circuit boards typically of 225° C. The 60/40 (Sn/Pb) (Sn/Pb/Ag), a temperature (i.e., 210°-218° C. T without damage

that particular solder has a liquidus temperature

he '502 patent and 301 ("the '301 patent was filed, Conceptronics' line after discontinued the '301 selling the "HVC" or to trial, the parties' litigation of claim 1 of by the HVC series of tation requiring the used infrared panel tation that the temperature must be maintained."

a request for a jury instruction to construe the reflow temperature" instruction sought by

question of whether the has been infringed by the as ovens, you have to those ovens maintain devices below the solder. The phrase "solder" the '502 patent means by the solder during wing during the final ing process, sometimes peak solder reflow temperature mean the "liquidus temperature at which the melt. Thus, if the temperature stays below that of the patent is infringed by series ovens.

ided that, as used in v temperature means e, i.e., a temperature above the liquidus temperature solder is completely ely. Conceptronic, on ded that solder reflow 3° C, i.e., the liquidus ular type of solder. "b) solder."

verdict of non-infringement Vitronics does not appeal

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the '502 patent describes types of solder which can flow process — 60/40 and 666/2 (Sn/Pb/Ag) indicates, has a liquidus 0° C and a peak reflow 0° to 218° C. At trial, we discussed only 63/37 is a liquidus temperature claims are not limited to

The district court delayed construing the disputed language until the close of testimony, at which time it ruled in favor of Conceptronic and concluded that the term "solder reflow temperature" as used in claim 1 refers to 183° C. Vitronics then conceded that the court was required to grant judgment as a matter of law in favor of Conceptronic, as Vitronics had not presented any evidence of infringement under the court's interpretation of solder reflow temperature. This appeal followed.

Claim Construction Aids Before the District Court

In spite of Vitronics' early request for a jury instruction on the proper claim construction, the district court delayed announcing its claim construction until hearing all the evidence put forth at trial. During trial, and in their briefs, to the district court in support of their respective claim constructions, the parties discussed the patent specification, expert testimony, prior testimony and writings of Vitronics and its employees, and technical references. The most pertinent materials are discussed below.

The Patent Specification

Vitronics relied heavily upon the patent itself to support its asserted claim construction. Although Vitronics conceded that the term "solder reflow temperature" may be ambiguous when considered in isolation, it argued that the specification clearly shows that, as used in the claim, solder reflow temperature means peak reflow temperature rather than the liquidus temperature. In particular, Vitronics pointed to that part of the specification that describes a preferred embodiment:

A preferred embodiment of the invention for reflow soldering of surface mounted devices to printed circuit boards will now be described. The printed circuit boards are typically made of epoxy-glass, such as fire retardant 4(FR-4), or polyamide glass. These boards typically degrade above temperatures of 225° C. The solder may be, for example, 60/40 (Sn/Pb), 63/37 (Sn/Pb), or 666/2 (Sn/Pb/Ag), all of which have a liquidus temperature (i.e. begin to melt) of about 190° C. and a peak reflow temperature of about 210°-218° C. Thus, to effect reflow soldering without damaging the board, the solder must

that particular solder or a solder with that particular liquidus temperature.

be allowed to reach a temperature of at least 210° C., but the board cannot reach a temperature of 225° C.

The board is then sent into a fifth zone 5 to bring the temperature of the board up to a temperature of approximately 210° C., the devices up to approximately 195° C., and the solder up to approximately 210° C. for a period of time of from about 10 to about 20 seconds to cause the solder to flow. Because the devices are cooler than the board, the solder flows up the devices. . . . The board spends approximately 60 seconds in the fifth zone, but only about 10 to 20 seconds at 210° C. Thus, the board is at the solder reflow temperature for only a short period of time and the devices never reach the solder reflow temperature.

Vitronics pointed out that, in the example described as the preferred embodiment, the temperature of the solder is raised to 210° C, the peak reflow temperature, and the temperature of the devices is raised to 195° C, 5° above the 190° C liquidus temperature. Thus, as argued by Vitronics, the term "solder reflow temperature" must be construed so that it refers to the peak reflow temperature because the claim requires that the temperature of the devices be maintained below "said solder reflow temperature"; if solder reflow temperature were construed to refer to liquidus temperature, the preferred embodiment would not be covered by the patent claims.

Expert Testimony

Conceptronic relied heavily on the expert testimony of Dr. Rothe. Dr. Rothe testified that the meaning of the term "solder reflow temperature" in claim 1 is synonymous with liquidus temperature. Dr. Rothe further testified that the solder reflow temperature for 63/37 (Sn/Pb) is 183° C. Dr. Rothe likewise testified at trial that several technical articles written by those skilled in the art supported his view that solder reflow temperature refers to liquidus temperature.

The Testimony of Mr. Hall

Conceptronic also relied on the testimony of Mr. Hall, the Chief Engineer at Vitronics. At trial, Mr. Hall confirmed that during his deposition he had testified that the reflow temperature of solder was 183° C. Mr. Hall also testified that, during his deposition, he had used solder reflow temperature to refer to liquidus temperature. However, at another point in his trial testimony, Hall ex-

plained that, while in his earlier deposition testimony he had used solder reflow temperature to refer to liquidus temperature, he did not suggest that was how the term was used in the patent. Rather, Hall testified the patent uses the term to refer to the peak reflow temperature.

Paper Written By Former Vitronics Employee

Conception also introduced into evidence a paper written by Phillip Zarrow, a former employee of Vitronics, defining solder reflow temperature in the following manner: "As the temperature of the solder paste on the interconnect passes the solder alloy's melting point and the solder enters a molten state, the assembly enters the reflow region of the process. For 63 Sn/37 Pb, a eutectic solder and the most common SMT alloy, reflow occurs at 183°C." Phillip Zarrow, *Convection/Infrared and Convection Dominant Reflow Soldering of Fine Pitch SMT Devices*, § 10.3.3 (1994). However, that same paper later describes the solder reflow process as taking the temperature of the solder above liquidus: "Most solder manufacturers recommend bringing the interconnection temperature approximately 15 to 25°C above the alloy melting point to achieve full liquidus and assure good solder flow and aid fillet formation." *Id.*

Memorandum of Plaintiff Vitronics Corporation in Opposition to Motion for Summary Judgment of Defendant Conception Corporation and In Support of Plaintiff's Cross-Motion for Summary Judgment of Patent Validity and Infringement

In its brief supporting its proposed construction of claim 1, both at the trial court level and here on appeal, Conception similarly relied on a memorandum written by Vitronics which contains the following language: "Tin/lead solders commonly used by the electronic products industry have a 'liquidus' or 'reflow' temperature in the order of 183°C, or about 361°F." However, this phrase is in the background section of the memorandum and later in the same memorandum, Vitronics discussed the issue of infringement as being whether the temperature of the devices was maintained below "the temperatures of the leads at which the solder is reflowing."

Without indicating which evidence it relied upon, the district court simply ruled that solder reflow temperature meant 183°C.

ANALYSIS

The Use of Intrinsic and Extrinsic Evidence in Claim Construction

A literal patent infringement analysis involves two steps: the proper construction of the asserted claim and a determination as to whether the accused method or product infringes the asserted claim as properly construed. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976, 34 USPQ2d 1321, 1326 (Fed. Cir. 1995) (in banc), *aff'd*, *U.S.*, 116 S. Ct. 1384, 1393 [38 USPQ2d 1461] (1996); *Hormone Research Found., Inc. v. Genentech, Inc.*, 904 F.2d 1558, 1562, 15 USPQ2d 1039, 1042 (Fed. Cir. 1990), *cert. dismissed*, 499 U.S. 955 (1991). The first step, claim construction, is a matter of law, which we review *de novo*. *Markman*, 52 F.3d at 979, 34 USPQ2d at 1329. Claim construction is the only step in the infringement analysis at issue in this appeal.¹

In determining the proper construction of a claim, the court has numerous sources that it may properly utilize for guidance. These sources have been detailed in our previous opinions, as discussed below, and include both intrinsic evidence (e.g., the patent specification and file history) and extrinsic evidence (e.g., expert testimony).

It is well-settled that, in interpreting an asserted claim, the court should look first to the intrinsic evidence of record, i.e., the patent itself, including the claims, the specification and, if in evidence, the prosecution history. See *Markman*, 52 F.3d at 979, 34 USPQ2d at 1329. Such intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language.

First, we look to the words of the claims themselves, both asserted and nonasserted, to define the scope of the patented invention. See *Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620, 34 USPQ2d 1816, 1819 (Fed. Cir. 1995). Although words in a claim are generally given their ordinary and customary meaning, a patentee may choose to be his own lexicographer and use terms in a manner other than their ordinary meaning, as long as the special definition of the term is clearly stated in the patent specification or file history. *Hoechst Celanese Corp. v. BP Chems. Ltd.*, 78 F.3d 1575, 1578, 38 USPQ2d 1126, 1129 (Fed. Cir. 1996). "A technical term used in a patent document is

¹ No assertion was made that defendant infringed under the doctrine of equivalents.

interpreted would be given field of the from the patent that the invention means none, 904 F. ("It is a well that a patent lexicographer manner construction or more of the tions omitted.

Thus, we review the construction of the invention in the manner in which it is given meaning. The primary when it the claims operation. *Markman* USPQ2d at stated, "[c]l specification at 979, 34 USPQ2d contain invention well enough to enable one of ordinary skill in the art to make and use the invention. Claim construction is always a matter of law; it is the province of the court to decide upon a disputed claim.

Third, the prosecution history. *Id.* *Graham v. John Q. Newcomb, Inc.*, 148 USPQ 459, 463 (Ct. Cl. 1959), cert. denied, 358 U.S. 916 (1958). The prosecution history contains the statements made by the inventor, his attorney, and the examiner in the prosecution of the patent. Patent and critical significance of the meaning of the claim is found in the prosecution history. *Id.* *Thermon, Inc. v. American International Corp.*, 1576, 34 USPQ2d 1126, 1129 (Fed. Cir. 1995). ("The interpretation of any term in a patent is given its ordinary meaning unless the patentee has shown that it should be given a different meaning. The prosecution history is one source of evidence that may be used to determine the meaning of a term. *Aul States, Inc. v. American International Corp.*, 384 F.2d 1004 (Ct. Cl. 1962). The source material wrapper given not cover.")

LYSIS

and Extrinsic Evidence

ingement analysis in proper construction of a determination as to method or product in claim as properly construed. *estview Instruments, Inc.*, 34 USPQ2d 1321, 55 F.3d 1384, 1393 (9th Cir. 1996); *Hormone Research, Inc. v. Genentech, Inc.*, 904 F.2d 1039, 1042 (9th Cir. 1991), *aff'd*, 505 U.S. 117, 118 S.Ct. 1384, 1393 (1992). Thus, claim construction, which we review *de novo*, 34 USPQ2d at 979, 34 F.3d at 1321, 55 F.3d at 1384, 1393 (9th Cir. 1996). Proper construction is the proper construction of numerous sources that provide guidance. These sources include the patent specification, the prosecution history, and extrinsic evidence (e.g., the patent specification, the prosecution history, and extrinsic evidence).

First, in interpreting an art should look first to the public record, i.e., the patent claims, the prosecution history, and extrinsic evidence (e.g., the patent specification, the prosecution history, and extrinsic evidence).

Second, in interpreting an art should look first to the public record, i.e., the patent claims, the prosecution history, and extrinsic evidence (e.g., the patent specification, the prosecution history, and extrinsic evidence).

Third, words of the claims themselves, and nonasserted, the patented invention. *Research, Inc. v. Genentech, Inc.*, 55 F.3d 1384, 1393 (9th Cir. 1996). In a claim are general and customary may choose to be his use terms in a manner ordinary meaning, as definition of the term is patent specification or *Velanese Corp. v. BP*, 1575, 1578, 38 Fed. Cir. 1996 ("A patent document is

made that defendant in- of equivalents.

interpreted as having the meaning that it would be given by persons experienced in the field of the invention, unless it is apparent from the patent and the prosecution history that the inventor used the term with a different meaning." (citations omitted); *Hormone*, 904 F.2d at 1563, 15 USPQ2d at 1043 ("It is a well-established axiom in patent law that a patentee is free to be his or her own lexicographer and thus may use terms in a manner contrary to or inconsistent with one or more of their ordinary meanings.") (citations omitted).

Thus, second, it is always necessary to review the specification to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning. The specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication. *Markman*, 52 F.3d at 979, 34 USPQ2d at 1330. As we have repeatedly stated, "[c]laims must be read in view of the specification, of which they are a part." *Id.* at 979, 34 USPQ2d at 1329. The specification contains a written description of the invention which must be clear and complete enough to enable those of ordinary skill in the art to make and use it. Thus, the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.

Third, the court may also consider the prosecution history of the patent, if in evidence. *Id.* at 980, 34 USPQ2d at 1330; *Graham v. John Deere*, 383 U.S. 1, 33, 148 USPQ 459, 473 (1965). This history contains the complete record of all the proceedings before the Patent and Trademark Office, including any express representations made by the applicant regarding the scope of the claims. As such, the record before the Patent and Trademark Office is often of critical significance in determining the meaning of the claims. See *Markman*, 52 F.3d at 980, 34 USPQ2d at 1330; *Southwall Tech., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1576, 34 USPQ2d 1673, 1676 (Fed. Cir. 1995) ("The prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during prosecution.") (citations omitted). Included within an analysis of the file history may be an examination of the prior art cited therein. *Autogiro Co. of America v. United States*, 384 F.2d 391, 399, 155 USPQ 697, 704 (Ct. Cl. 1967) ("In its broader use as source material, the prior art cited in the file wrapper gives clues as to what the claims do not cover.").

In most situations, an analysis of the intrinsic evidence alone will resolve any ambiguity in a disputed claim term. In such circumstances, it is improper to rely on extrinsic evidence. See, e.g., *Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1216, 36 USPQ2d 1225, 1228 (Fed. Cir. 1995) ("In construing the claims we look to the language of the claims, the specification, and the prosecution history. Extrinsic evidence may also be considered, if needed to assist in determining the meaning or scope of technical terms in the claims.") (citations omitted, emphasis added); *Hormone*, 904 F.2d at 1562, 15 USPQ2d at 1043 ("Claim interpretation involves a review of the specification, the prosecution history, the claims (including unasserted as well as asserted claims), and, if necessary, other extrinsic evidence, such as expert testimony.") (citations omitted, emphasis added). In those cases where the public record unambiguously describes the scope of the patented invention, reliance on any extrinsic evidence is improper. The claims, specification, and file history, rather than extrinsic evidence, constitute the public record of the patentee's claim, a record on which the public is entitled to rely. In other words, competitors are entitled to review the public record, apply the established rules of claim construction, ascertain the scope of the patentee's claimed invention and, thus, design around the claimed invention. See *Markman*, 52 F.3d at 978-79, 34 USPQ2d at 1329. Allowing the public record to be altered or changed by extrinsic evidence introduced at trial, such as expert testimony, would make this right meaningless. See *Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678 ("A patentee may not proffer an interpretation for the purposes of litigation that would alter the indisputable public record consisting of the claims, the specification and the prosecution history, and treat the claims as a 'nose of wax.'" (quoting *Senmed, Inc. v. Richard-Allan Med. Indus., Inc.*, 888 F.2d 815, 819 n.8, 12 USPQ2d 1508, 1512 n.8 (Fed. Cir. 1989)). The same holds true whether it is the patentee or the alleged infringer who seeks to alter the scope of the claims.

The Proper Construction of the Claim Term "Solder Reflow Temperature"

[1] As can be readily seen from those portions of the specification set forth above, the meaning of the disputed term "solder reflow temperature" in claim 1 of the '502 patent is clear from a reading of the claim itself and the patent specification. The "peak reflow temperature" and "liquidus temperature" are clearly defined in the specification

as having distinctly different meanings. Specifically, for the solders described in the specification, liquidus temperature is about 190° C and the peak reflow temperature is about 210° to 218° C. Moreover, in the preferred embodiment described in the patent, the solder is heated to a temperature of 210° C but the temperature of the devices is maintained at approximately 195° C, i.e., below the peak reflow temperature (210° C) but above the liquidus temperature (190° C). Therefore, in order to be consistent with the specification and preferred embodiment described therein, claim 1 must be construed such that the term "solder reflow temperature" means the peak reflow temperature, rather than the liquidus temperature. Indeed, if "solder reflow temperature" were defined to mean liquidus temperature, a preferred (and indeed only) embodiment in the specification would not fall within the scope of the patent claim. Such an interpretation is rarely, if ever, correct and would require highly persuasive evidentiary support, which is wholly absent in this case. See *Modine Mfg. Co. v. United States Int'l Trade Comm'n*, 75 F.3d 1545, 1550, 37 USPQ2d 1609, 1612 (Fed. Cir. 1996); see also *Hoechst*, 78 F.3d at 1581, 38 USPQ2d at 1130 ("We share the district court's view that it is unlikely that an inventor would define the invention in a way that excluded the preferred embodiment, or that persons of skill in this field would read the specification in such a way.").

The District Court's Reliance on Extrinsic Evidence

Since the claim, read in light of the patent specification, clearly uses the term "solder reflow temperature" to mean the peak reflow temperature, rather than the liquidus temperature, that should have been the end of the trial court's analysis.² Only if there were still some genuine ambiguity in the claims, after consideration of all available intrinsic evidence, should the trial court have resorted to extrinsic evidence, such as expert testimony, in order to construe claim 1. Moreover, even if the judge permissibly decided to hear all the possible evidence before construing the claim, the expert testimony, which was inconsistent with the specification and file history, should have been accorded no weight. *Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678; *Markman*, 52 F.3d at 983, 34 USPQ2d at 1333.

² The file history was apparently not put into evidence.

Here, the trial judge considered not only the specification, but also expert testimony and other extrinsic evidence, such as the paper written by the former Vitronics employee. No doubt there will be instances in which intrinsic evidence is insufficient to enable the court to determine the meaning of the asserted claims, and in those instances, extrinsic evidence, such as that relied on by the district court, may also properly be relied on to understand the technology and to construe the claims. See *Markman*, 52 F.3d at 979, 34 USPQ2d at 1329. Extrinsic evidence is that evidence which is external to the patent and file history, such as expert testimony, inventor testimony, dictionaries, and technical treatises and articles.³ *Id.* at 980, 34 USPQ2d at 1330. However, as we have recently re-emphasized, extrinsic evidence in general, and expert testimony in particular, may be used only to help the court come to the proper understanding of the claims; it may not be used to vary or contradict the claim language. *Id.* at 981, 34 USPQ2d at 1331. Nor may it contradict the import of other parts of the specification. Indeed, where the patent documents are unambiguous, expert testimony regarding the meaning of a claim is entitled to no weight. *Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678. "Any other rule would be unfair to competitors who must be able to rely on the patent documents themselves, without consideration of expert opinion that then does not even exist, in ascertaining the scope of a patentee's right to exclude." *Id.* at 1578, 34 USPQ2d at 1678-79. Nor may the inventor's subjective intent as to claim scope, when unexpressed in the patent documents, have any effect. Such testimony cannot guide the court to a proper interpretation when the patent documents themselves do so clearly.

In addition, a court in its discretion may admit and rely on prior art proffered by one of the parties, whether or not cited in the specification or the file history. This prior art can often help to demonstrate how a disputed term is used by those skilled in the art. Such art may make it unnecessary to rely on expert testimony and may save much trial

³ Although technical treatises and dictionaries fall within the category of extrinsic evidence, as they do not form a part of an integrated patent document, they are worthy of special note. Judges are free to consult such resources at any time in order to better understand the underlying technology and may also rely on dictionary definitions when construing claim terms, so long as the dictionary definition does not contradict any definition found in or ascertained by a reading of the patent documents.

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Unfort the extri the mani judge wa and other in the rel ics emple der reflow perature relied on clusion t tempera gardless interpret those of patent d documen meaning nesses, w by the p cation a ny tendi art wou stand "s the sold no weigl ing sho wall, 54 ("Even ter-depe skilled i in the " definitio the cla specific fined th on this and, he

⁴ Alth not app the test "solder perature testimor (Sn/Pb)

judge considered not only but also expert testimony. Extrinsic evidence, such as the former Vitronics employees, there will be instances in which evidence is insufficient to determine the meaning of terms, and in those instances, such as that relied on by the court, may also properly be relied on the technology and to construe the technology. See *Markman*, 52 F.3d at 1329. Extrinsic evidence which is external to the story, such as expert testimony, dictionaries, and articles. *Id.* at 980, 1330. However, as we have said, extrinsic evidence in the testimony in particular, to help the court come to a understanding of the claims; it is to vary or contradict the *id.* at 981, 34 USPQ2d at 1678. It contradicts the import of the specification. Indeed, the documents are unambiguous regarding the meaning entitled to no weight. *Southwall*, 54 F.3d at 1678. It would be unfair to competitors to rely on the patent itself, without considering opinion that then does not ascertaining the scope of a claim to exclude. *Id.* at 1578, 34 USPQ2d at 1679. Nor may the inventor's testimony as to claim scope, when the patent documents, have testimony cannot guide the court's interpretation when the patent documents do so clearly. The court in its discretion may rely on prior art proffered by one party or not cited in the patent file history. This prior art does not demonstrate how a disputed term is used in the art. Such testimony is unnecessary to rely on and may save much trial

time. As compared to expert testimony, which often only indicates what a particular expert believes a term means, prior art references may also be more indicative of what all those skilled in the art generally believe a certain term means. Once again, however, reliance on such evidence is unnecessary, and indeed improper, when the disputed terms can be understood from a careful reading of the public record. See *Kearns v. Chrysler Corp.*, 32 F.3d 1541, 1547, 31 USPQ2d 1746, 1750 (Fed. Cir. 1994). Nor may it be used to vary claim terms from how they are defined, even implicitly, in the specification or file history.

Unfortunately, here the trial judge did use the extrinsic evidence to vary or contradict the manifest meaning of the claims. The trial judge was presented with expert testimony and other evidence that some of those skilled in the relevant art, including certain Vitronics employees, sometimes used the term "solder reflow temperature" and "liquidus temperature" interchangeably. He apparently relied on this testimony in reaching his conclusion that, as used in claim 1, solder reflow temperature meant 183° C.⁴ However, regardless of how those skilled in the art would interpret a term in other situations, where those of ordinary skill, on a reading of the patent documents, would conclude that the documents preclude the term being given the meaning propounded by the expert witnesses, we must give it the meaning indicated by the patentee in the patent claim, specification and file history. Thus, expert testimony tending to show that those skilled in the art would, in certain circumstances, understand "solder reflow temperature" to mean the solder liquidus temperature is entitled to no weight in light of the clear contrary meaning shown in the specification. See *Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678 ("Even if Southwall could show that 'sputter-deposited dielectric' has a meaning to one skilled in the art different from the definition in the '745 specification and file history, the definition in the patent documents controls the claim interpretation."). Because the specification clearly and unambiguously defined the disputed term in the claim, reliance on this extrinsic evidence was unnecessary and, hence, legally incorrect.

⁴ Although the trial judge's reasoning does not appear in the record, he must have relied on the testimony presented by Conceptronic that "solder reflow temperature" and "liquidus temperature" were synonymous and the undisputed testimony that the liquidus temperature of 63/37 (Sn/Pb) solder is 183° C.

[2] Had the district court relied on the expert testimony and other extrinsic evidence solely to help it understand the underlying technology, we could not say the district court was in error. But testimony on the technology is far different from other expert testimony, whether it be of an attorney, a technical expert, or the inventor, on the proper construction of a disputed claim term, relied on by the district court in this case. The latter kind of testimony may only be relied upon if the patent documents, taken as a whole, are insufficient to enable the court to construe disputed claim terms. Such instances will rarely, if ever, occur. Indeed, this case did not present such an instance. Even in those rare instances, prior art documents and dictionaries, although to a lesser extent, are more objective and reliable guides. Unlike expert testimony, these sources are accessible to the public in advance of litigation. They are to be preferred over opinion testimony, whether by an attorney or artisan in the field of technology to which the patent is directed. Indeed, opinion testimony on claim construction should be treated with the utmost caution, for it is no better than opinion testimony on the meaning of statutory terms. See *Markman*, 52 F.3d at 983, 34 USPQ2d at 1332-33 ("First, the testimony of Markman and his patent attorney on the proper construction of the claims is entitled to no deference. . . . This testimony about construction, however, amounts to no more than legal opinion — it is precisely the process of construction that the court must undertake.").

Other Issues

Conceptronic further argues that, even if we were to reverse the district court's decision regarding the proper interpretation of the term "solder reflow temperature," the district court's ultimate conclusion of no infringement as a matter of law can still be affirmed on the alternative ground that Vitronics' evidence does not prove infringement because Vitronics failed to test the temperature of all of the various devices on the boards and because certain of the Vitronics tests demonstrated that many of the devices reached temperatures above the peak reflow temperature. Vitronics, of course, disputes these assertions and points to supporting documentation to the effect that the Conceptronic ovens do indeed maintain the temperature of the devices below peak reflow temperature. The trial court made no decision on this issue. Moreover, such a determination at this stage would require our weighing sub-

technical treatises and dictionaries in the category of extrinsic evidence. They are worthy of special note, but should not be consulted at any time after understanding the underlying technology. They may also rely on dictionary definitions of claim terms, so long as the definition does not contradict any other evidence or ascertained by a reading of the patent documents.

stantial but conflicting evidence, an impermissible exercise for an appellate court. Accordingly, we must remand.

CONCLUSION

For all the foregoing reasons, the judgment of non-infringement as a matter of law is reversed and the case is remanded for further proceedings consistent with this opinion.

REVERSED AND REMANDED

COSTS

Costs in favor of Vitronics.

U.S. Court of Appeals Seventh Circuit

Rockwell Graphic Systems Inc. v. DEV Industries Inc.

Nos. 95-1280 & 95-1351

Decided July 30, 1996

JUDICIAL PRACTICE AND PROCEDURE

1. Procedure — Contempt; sanctions (\$410.49)

Federal district court abused its discretion by deciding not to address material factual allegations in plaintiff's show cause motion to hold third parties in civil contempt of injunctions prohibiting use of trade secrets, and by instead denying motion on ground that third parties were not in privity with those named in injunctions, since party who seeks enforcement of injunction in civil contempt proceeding, as well party against whom contempt is sought, is entitled to resolution of genuine issues of material fact that bear upon allegations made in support of contempt finding, and since district court's method of disposing of motion in present case, in which question of whether third parties were bound by injunctions was divorced from issue of whether their conduct violated injunctions, foreclosed adequate ventilation of salient issues in dispute and deprived plaintiff of opportunity to prove that contempt existed.

Appeal from the U.S. District Court for the Northern District of Illinois, Williams, J.

Actions by Rockwell Graphic Systems Inc. against DEV Industries Inc., Press Machinery Corp., Robert J. Fleck, Toshio Yamagata, Michael Schwartz, and Randall Coakley Jr. for misappropriation of trade secrets. Following issuance of injunctions in those actions, plaintiff moved for rule to show cause why Toshio Yamagata and Tensor Group Inc., the present appellees,* should not be held in contempt. From denial of motion, plaintiff appeals. Vacated and remanded; Eschbach, J., concurring in separate opinion.

Prior decision: 17 USPQ2d 1780.

Michael O. Warnecke, Deborah S. Ruff, and Richard A. Speer, of Mayer, Brown & Platt, Chicago, Ill.; Wayne L. Tang, Jeanne M. Gills, Scott R. Lasser, and Tracy E. Donner, of Keek, Mahin & Cate, Chicago; Sharon R. Barner, of Foley & Lardner, Chicago, for appellant.

James K. Meguerian and Steven L. Baron, of D'Ancona & Pflaum, Chicago, for appellee Toshio Yamagata.

John S. Letchinger, Craig S. Fochler, and John W. Costello, of Wildman, Harrold, Allen & Dixon, Chicago, for appellee Tensor Group Inc.

Before Eschbach, senior circuit judge, and Kanne and Evans, circuit judges.

Kanne, J.

This protracted litigation, which involves two separate though related lawsuits, has occupied the resources of the district court since 1984. At the conclusion of each of the two proceedings, the district court issued an injunction prohibiting the named parties from engaging in a variety of acts involving trade secret information misappropriated

* The appellant asserted claims for relief based upon two injunctions entered by the district court in these civil actions. Neither injunction named the appellees as enjoined parties. (Yamagata was named in the second injunction only as an officer of DEV), but the appellant's claims are premised upon the appellees' active concert or participation with those named in the injunctions. The appellees did not contest the district court's exercise of personal jurisdiction. Accordingly, we view this matter as part of the original civil actions over which the district court maintains jurisdiction to modify or enforce the injunctions. See *United States v. Swift & Co.*, 286 U.S. 106, 114-15, 52 S. Ct. 460, 462 (1932); *Leman v. Krentler-Arnold Hinge Last Co.*, 284 U.S. 448, 452-53, 52 S. Ct. 238, 240 (1932).

Appendix 6

E.I du Pont de Nemours & Co. v. Phillips Petroleum Co., 849 F.2d 1430, 7 U.S.P.Q.2d 1129
(Fed. Cir. 1988), *cert. denied*, 488 U.S. 986 (1988)

Distilling's activity in the ct of Illinois fails both tests. ing's total business activity dered localized, systematic, he State of Illinois could not c Distilling to qualify to do

as discussed, the Court holds istilling does not reside in the ct of Illinois and that there Northern District of Illinois Majestic Distilling under Sec-

ransfer

1406(a)(1985) permits a dis-nsfer a case "laying venue in on or district" if the transfer he interest of justice." The s that it is in the interest of er this lawsuit against Majes-the District of Maryland. If ised rather than transferred, is in Counts II and III would he sixty-day limitation that is to federal district courts & cancellation and opposition U.S.C. § 1071(b). See, e.g., *Winery*, 192 U.S.P.Q. at 213 a) transfer warranted when y effectively preclude the appealing the decision of the al and Appeal Board.").

ees

istilling has moved for an rney's fees pursuant to the mark Act, 15 U.S.C. § le 11 of the Federal Rules of e. See, e.g., *Noxell Corp. v. 1 Bar-b-que Restaurant*, 771 USPQ 521] (D.C. Cir. 1985) rney's fees under the Lanham ceptional case"); *Eiger Ma*. J.S.P.Q. 51 (N.D. Ill. 1985) rney's fees under Rule 11). s not find that any award of s is warranted in this case. cting law regarding venue in unfair competition actions, and s not find that plaintiffs' at-e venue in this District was aith, or was without any sup-act. Plaintiffs have argued for of venue for trademark and ition cases, and the Court has arguments. These arguments,

rs advertises in the *Illinois Bever*-d it does so without any sponsor-rom Majestic Distilling. *Id.*

however, should not expose plaintiffs to li-ability for attorney's fees.

Conclusion

Plaintiffs cannot maintain their lawsuit against Majestic Distilling in the Northern District of Illinois. The causes of action alleged in this suit did not arise in this district, and both defendants to the lawsuit do not reside in this district. Although venue is proper as to Valley Liquors, this Court will not allow plaintiff to join a minor distributor to lodge venue in a district inappropriate as to the manufacturer. Accordingly, plaintiffs' lawsuit against Majestic Distilling is severed and transferred, pursuant to 28 U.S.C. § 1406(a), to the United States District Court for the District of Maryland. Plaintiff's lawsuit against Valley Liquors, however, is not transferred. First, Valley Liquors has not moved to transfer the lawsuit against it. Moreover, the United States District Court for the District of Maryland is not a district where the lawsuit against Valley Liquors "might have been brought," see 28 U.S.C. § 1404(a); the cause of action against Valley Liquors did not arise in the District of Maryland, and Valley Liquors is not a resident of Maryland. The court sets a status conference for the remaining case of *Scotch Whisky v. Valley Liquors*, for March 29, 1988 at 9:00 AM.

Court of Appeals, Federal Circuit

E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co.

Nos. 87-1259 and 87-1284

Decided June 15, 1988

PATENTS

1. Patent construction — Specifications and drawings — In general (§125.1101)

Patent construction — Claims — In general (§125.1301)

Federal district court erred by incorporating two extraneous property limitations into claims, since, even though specification can be used to interpret what patentee meant by word or phrase in claim, limitation that is not required in specification should not be read from specification into claims.

2. Patentability/Validity — Anticipation — Prior art (§115.0703)

Patent infringement defendant must, in order to demonstrate that claims at issue

were anticipated under 35 USC 102(g), demonstrate that copolymers it produced prior to invention possessed strength limitations of claims at issue, although defendant need not prove awareness by its researchers that those copolymers possessed those properties, and it can rely not only on its patent applications but also on notebook data.

3. Patentability/Validity — Anticipation — Prior art (§115.0703)

Patentability/Validity — Obviousness — Relevant prior art (§115.0903)

Federal district court erred by determining that prior work under 35 USC 102(g) can qualify as prior art under 35 USC 103 only if work is known to art or to patentee prior to making invention, since prior art under 35 USC 103 includes all work made prior to patentee's invention, regardless of when that work is made public or patent applications are filed, so long as work is found not to have been abandoned, suppressed, or concealed.

4. Practice and procedure in U.S. Patent and Trademark Office — Prosecution — In general (§110.0901)

Infringement — Defenses — Prosecution history estoppel (§120.1105)

Patent construction — Claims — Defining terms (§125.1305)

Arguments made during prosecution history are relevant in determining meaning of terms at issue, and such arguments, as well as other aspects of prosecution history, must be examined to ascertain true meaning of what inventor intended to convey in claims, and use of prosecution history in such manner differs from prosecution history estoppel, which is applied as limitation upon doctrine of equivalents after claims have been properly interpreted.

REMEDIES

5. Monetary — Damages — Patents — Increased damages (§510.0507.07)

Orthokinetics Inc. v. Safety Travel Chairs Inc., 1 USPQ2d 1081, does not alter standard of proof, as set out in *Shatterproof Glass Corp. v. Libbey-Owens Ford Co.*, 225 USPQ 634, requiring that willful infringement be demonstrated by clear and convincing evidence.

Particular patents — Chemical — Polymers

4,076,698, Lamb, et al., plasticized polymers of vinyl acetate, finding of failure to

prove invalidity reversed for claims 2, 5, 10, and 14 and vacated for claims 1 and 12; cause remanded.

Appeal from the U.S. District Court for the District of Delaware, Latchum, J.; 2 USPQ2d 1545.

Plaintiff E.I. du Pont de Nemours & Co. brought patent infringement action against Phillips Petroleum Co., Phillips 66 Co., and Phillips Driscopipe Inc. From judgment holding that plaintiff failed to prove that infringement was willful, plaintiff appeals; defendants cross-appeal holding of infringement and failure to prove invalidity and unenforceability. Affirmed in part, reversed in part, vacated in part, and remanded.

John O. Tramontine, Fish & Neave, New York, N.Y., for plaintiff-appellant (Edward F. Mullooney, Glenn A. Ousterhout, and Thomas J. Vetter on the brief).

Philip S. Beck, Kirkland & Ellis, Chicago, Ill., for defendants-cross-appellants (Harry J. Roper and George S. Bosy, Neuman, Williams, Anderson and Olson, Chicago, on the brief).

Before Bissell, circuit judge, and Miller, senior circuit judge*

Bissell, J.

E.I. du Pont de Nemours & Company ("Du Pont") appeals from a judgment of the United States District Court for the District of Delaware, *see E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co.*, 656 F.Supp. 1343, 2 USPQ2d 1545 (1987), that Du Pont failed to prove that the infringement of claims 1, 2, 5, 10, 12 and 14 of its U.S. Patent No. 4,076,698 ('698) was willful. Phillips Petroleum Company, Phillips 66 Company, and Phillips Driscopipe, Inc. (collectively, "Phillips"), the alleged infringers, cross-appeal from the district court's judgment that Du Pont proved infringement and that Phillips failed to prove invalidity under 35 U.S.C. §§102(g), 103 (1982 & Supp. III 1985), and unenforceability due to inequitable conduct. We affirm in part, reverse in part, vacate in part, and remand for further proceedings consistent with this opinion.

* Circuit Judge Archer heard oral argument in these appeals but subsequently recused himself, taking no position in the decision of this case.

BACKGROUND

Polymers are large molecules formed when a smaller molecule, known as a monomer, joins chemically to itself in a repeating fashion. Forming a copolymer¹ involves joining different monomers. In Du Pont's invention, ethylene, a monomer, is copolymerized with a "higher alpha-olefin." This is a hydrocarbon having between 5 and 18 carbon atoms with a single double bond at one end.²

The copolymers of the six claims at issue are in part defined by their properties. Consider, for example, claim 5:

5. An interpolymer of ethylene and a higher olefinic hydrocarbon having 5 to 10 carbon atoms per molecule, said higher olefinic hydrocarbon having one terminal $\text{CH}=\text{CH}_2$ per molecule and no other olefinic unsaturation, said interpolymer being further characterized in that it has an X-ray crystallinity in the range of 40 to 70%, a melt index in the range of 0.3 to 20, a density in the range of 0.9 to 0.95 and said interpolymer being further characterized in that its density is not less than 0.93 unless the content of said higher olefinic hydrocarbon in the interpolymer is at least 3% by weight.

The remaining claims are similar, though claim 1 requires a certain "Elmendorf tear strength," and claim 12 requires a specified hoop stress. All six claims are reproduced in the Appendix below.

Du Pont filed its original patent application on March 1, 1956, and a continuation-in-part (CIP) application, S.N. 632,416, on January 4, 1957. The '698 patent issued from the CIP application on February 28, 1978, to Anderson and Stamatoff. The delay in issuance was partially due to an interference proceeding before the Board of Patent Interferences at the United States Patent & Trademark Office (PTO). As originally filed, the application contained both product and process claims. However, the process claims were cancelled following the interference proceeding, leaving 15 product claims in the '698 patent.

In 1981, Du Pont filed the infringement suit now on appeal. Phillips in its Answer and Counterclaim alleged invalidity, unenforceability, and noninfringement. In a bifurcated trial, the court tried the liability issues from July 21, 1986 through August 18, 1986. During the district court proceedings, the

¹ I.e., "interpolymer."

² In comparison, a "lower alpha-olefin" would have 3-4 carbon atoms.

PTO conducted a trial proceeding culminated, or rejection of all Du Pont appeals to the Board of Patent Appeals but that appeals were denied in 1986.

Included in the appeal were the claims of the '698 patent — reissued by the PTO in 1986.

At trial, Du Pont sought to prove through the witness testimony that the claimed interpolymers in the U.S. Patent No. 4,076,698 were characterized by the properties claimed in the claims. The district court found that the properties claimed in the claims were not proven by the testimony. The district court's judgment, incorporating the limitations in the claims, was not unenforceable.

1. Whether the claims are valid.

2. Whether the claims are enforceable under 35 U.S.C. §102(g).

3. Whether the claims are enforceable under 35 U.S.C. §103.

4. Whether the claims are enforceable under 35 U.S.C. §104.

5. Whether the claims are enforceable under 35 U.S.C. §105.

6. Whether the claims are enforceable under 35 U.S.C. §106.

I. Validity.

A. Claim 1.

The district court found that Du Pont's claims were not enforceable under 35 U.S.C. §102(g) when compared to the prior art. The district court found that the claims were not enforceable under 35 U.S.C. §103 when compared to the prior art. The district court found that the claims were not enforceable under 35 U.S.C. §104 when compared to the prior art. The district court found that the claims were not enforceable under 35 U.S.C. §105 when compared to the prior art. The district court found that the claims were not enforceable under 35 U.S.C. §106 when compared to the prior art.

BACKGROUND

large molecules formed molecule, known as a monally to itself in a repeating a copolymer involves monomers. In Du Pont's e, a monomer, is copolymer alpha-olefin." This is living between 5 and 18 a single double bond at

of the six claims at issue l by their properties. Con, claim 5: polymer of ethylene and a hydrocarbon having 5 to 10 per molecule, said higher rbon having one terminal -molecule and no other oleon, said interpolymer be-acterized in that it has anity in the range of 40 to ex in the range of 0.3 to 20, e range of 0.9 to 0.95 and er being further character-ensity is not less than 0.93 ent of said higher olefinic the interpolymer is at least

claims are similar, though a certain "Elmendorf tear aim 12 requires a specified x claims are reproduced in ow. its original patent applica- 1956, and a continuation- plication, S.N. 632,416, on . The '698 patent issued plication on February 28, n and Stamatoff. The delay artially due to an interfer- before the Board of Patent the United States Patent & ce (PTO). As originally tion contained both product ms. However, the process elled following the interfer- leaving 15 product claims it. Pont filed the infringement al. Phillips in its Answer and eged invalidity, unenforcea- infringement. In a bifurcated ried the liability issues from through August 18, 1986. rict court proceedings, the

mer." , a "lower alpha-olefin" would oms.

PTO conducted a merged reissue/reexamination proceeding of the '698 patent that culminated, on May 12, 1986, with a final rejection of all the claims. On June 11, 1986, Du Pont appealed that rejection to the PTO Board of Patent Appeals and Interferences but that appeal was stayed as of August 6, 1986.

Included in the prior art Phillips relied on at trial were the three items relied on in the appeal: (1) the 1955 work of Witt and Leatherman — researchers for Phillips; (2) Vandenberg U.S. Patent No. 3,058,963; and (3) Brown U.S. Patent No. 2,728,752.

At trial, Du Pont conceded that Phillips, through the work of Witt and Leatherman, made ethylene/higher alpha-olefin copolymers in the United States before the date of the claimed invention. However, Du Pont claimed that its copolymers could be distinguished from those of Phillips because of two properties disclosed in its patent specification but not expressly written into the claims. The district court accepted Du Pont's argument, incorporated those two properties as limitations into the six claims at issue, and determined that the claims were not invalid, not unenforceable, and infringed but not willfully.

ISSUES

1. Whether the district court erred in incorporating two extraneous property limitations into the claims.
2. Whether the district court erred in holding that the claims were not invalid under 35 U.S.C. §102(g).
3. Whether the district court erred in holding that the claims were not invalid under 35 U.S.C. §103.
4. Whether the district court erred in holding that the patent was not unenforceable.
5. Whether the district court clearly erred in finding that the claims were infringed.
6. Whether the district court applied the incorrect standard of proof regarding willful infringement.

OPINION

I. Validity

A. Claim Interpretation

The district court believed that the essence of Du Pont's invention is that its copolymers, when compared with "free-radical polyethylene, with linear polyethylene and with comparable copolymers of ethylene . . . and the lower alpha-olefins," possess superior (1) environmental stress crack resistance and (2) impact strength. *Du Pont*, 656 F.Supp. at

1350, 2 USPQ2d at 1547. The district court interpreted the claims as including those two properties. In doing so, it erred.

The significance of claims in defining as invention was clearly expressed by our predecessor court in *Autogiro Co. of America v. United States*, 384 F.2d 391, 395-96, 155 USPQ 697, 701 (Ct. Cl. 1967):

The claims of the patent provide the concise formal definition of the invention. They are the numbered paragraphs which 'particularly [point] out and distinctly [claim] the subject matter which the applicant regards as his invention.' 35 U.S.C. §112. It is to these wordings that one must look to determine whether there has been infringement. [Footnote omitted.] Courts can neither broaden nor narrow the claims to give the patentee something different than what he has set forth. [Footnote omitted.] No matter how great the temptations of fairness or policy making, courts do not rework claims. They only interpret them.

In accordance with that instruction, this court has consistently adhered to the proposition that courts "cannot alter what the patentee has chosen to claim as his invention." *SSIH Equipment S.A. v. U.S. Int'l Trade Comm.*, 718 F.2d 365, 378, 218 USPQ 678, 689 (Fed. Cir. 1983) (citing *Autogiro*); see also *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 867, 228 USPQ 90, 93 (Fed. Cir. 1985) ("Generally, particular limitations or embodiments appearing in the specification will not be read into the claims."). Indeed, neither Du Pont nor the district court cites any case of this court reading extraneous limitations into a claim.

It is entirely proper to use the specification to interpret what the Patentee meant by a word or phrase in the claim. See, e.g., *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 867, 228 USPQ 90, 93 (Fed. Cir. 1985). But this is not to be confused with adding an extraneous limitation appearing in the specification, which is improper. By "extraneous," we mean a limitation read into a claim from the specification wholly apart from any need to interpret what the patentee meant by particular words or phrases in the claim. "Where a specification does not require a limitation, that limitation should not be read from the specification into the claims." *Specialty Composites v. Cabot Corp.*, Nos. 87-1456, -1457, slip op. at 11 [6 USPQ2d 1601 at 1605] (Fed. Cir. April 27, 1988 (emphasis in original), citing *Lemelson v. United States*, 752 F.2d 1538, 1551-52, 224 USPQ 526, 534 (Fed. Cir. 1985).

Although the district court cited as support *United States v. Adams*, 383 U.S. 39,

148 USPQ 470 (1966), *Adams* does not support reading into the claims extraneous limitations from the specification. *Adams* involved claims to a battery comprising a combination of various claimed elements, none of which was water. *Adams* argued that the battery, unlike prior art batteries, could be successfully and unexpectedly operated with water. Though using water was not expressly included in the claims, that unexpected feature was relevant to the Court's decision on nonobviousness. See, e.g., *Graham v. John Deere*, 383 U.S. 1, 17-18, 145 USPQ 459, 467 (1966) (objective indicia are probative of nonobviousness).

It was not necessary for the Court in *Adams* to read, and the Court did not read, a "water" limitation into the claims. The Court discussed the water feature only when considering rebuttal of defendant's argument of obviousness. Properly interpreted, *Adams* does not deviate from this language in a Supreme Court precedent that *Adams* refers to for authority:

[W]e know of no principle of law which would authorize us to read into a claim an element which is not present, for the purpose of making out a case of novelty or infringement. The difficulty is that if we once begin to include elements not mentioned in the claim in order to limit such claim and avoid a defense or anticipation, we should never know where to stop.

McCarty v. Lehigh Valley R. Co., 160 U.S. 110, 116 (1895) (cited in *Adams*, 383 U.S. at 48-49, 148 USPQ at 482).

Du Pont contends that *Decca Limited v. United States*, 420 F.2d 1010, 164 USPQ 345 (Ct. Cl. 1970), cert. denied, 400 U.S. 865 [167 USPQ 321] (1970), supports the district court decision. It is mistaken. The claims at issue in *Decca* were written in "means plus function" format, which are subject to the last paragraph of 35 U.S.C. §112. Hence, resort to the specification in *Decca* was necessary not only pursuant to the normal rule of resorting to the specification to interpret what the patentee meant by claim language, but also, pursuant to statute.

[1] Although language in *Decca* and other Court of Claims decisions may have given the perception that claims are to be "saved" from invalidity by reading extraneous limitations into them, see, e.g., *SSIH Equipment S.A. v. USITC*, 718 F.2d 365, 385, 218 USPQ 678, 695 (Fed. Cir. 1983) (Smith, J., concurring in part, dissenting in part), this court's consistent approach in interpreting claims, and in rejecting resort to extraneous limitations from the specification, should have negated that perception by now. See

Sjolund v. Muslund, Norsol, Inc. and Wink Corp., No. 87-1496, slip op. at 23 [6 USPQ2d 2020, 2027-2027] (Fed. Cir. June 1, 1988) ("limitations from the specification are not to be read into the claims"). Thus, the district court was wrong as a matter of law in reading into the claims at issue the two extraneous property limitations mentioned above. The remainder of this opinion, and the proceedings on remand below, shall treat the claims as not containing those limitations.

B. Novelty — 35 U.S.C. §102(g)

The novelty issue relates to 35 U.S.C. §102(g) which states that a person is entitled to a patent unless "before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it."

The claims in this case fall into two groups. One group — claims 2, 5, 10 and 14 — contains limitations pertaining only to density, percent crystallinity, melt indices, percent monomer, and type of monomer. Independent claim 5, reproduced above, is representative. Du Pont has conceded that the Witt and Leatherman copolymers of Phillips made in this country before the Du Pont invention, satisfied those limitations.³ Because it is conceded that the copolymers of claims 2, 5, 10 and 14 are anticipated by the prior work of Phillips, we reverse the district court's determination with respect to these claims, and hold these claims invalid.

[2] The second group of claims — claims 1 and 12 — must be addressed on remand. Those two claims include a limitation not

³ At trial, Du Pont conceded as follows:

DuPont judicially admits that before the date of DuPont's invention of the patent in suit, Gerald T. Leatherman and Donald R. Witt, researchers at Phillips, made in the United States copolymers of ethylene with propylene, ethylene with 1-butene, ethylene with 1-pentene and ethylene with 1-hexene. That those ethylene with 1-pentene copolymers had comonomer-type, density, melt index, percent crystallinity and weight percent comonomer content falling within the ranges expressly called for by the claims asserted against Phillips in this action.

That those ethylene-1-hexene copolymers had comonomer-type, density, percent crystallinity and weight percent comonomer content falling within the ranges expressly called for by the claims asserted against Phillips in this action and melt indices of 0.19 and 0.27.

DuPont will not attempt to prove in this action that the invention of the patent in suit was made by DuPont before the dates that those ethylene-1-pentene copolymers and ethylene-1-hexene copolymers were made by Gerald T. Leatherman and Donald R. Witt.

present in conceded Witt and I includes th a film, an range of 1. 12, which of pipe, strength in anticipation court must burden of evidence th Du Pont's ties. See *A Sowa & S* 220 USPQ 469 U.S. 8 Phillips

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Id., 778 F

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Norsol, Inc. and Wink, slip op. at 23 [6-2027] (Fed. Cir. June 5, 1986) (the specification is wrong as a matter of the claims at issue the property limitations men- remainder of this opinion, on remand below, shall not containing those

5 U.S.C. §102(g).

relates to 35 U.S.C. that a person is entitled "before the applicant's invention was made in ther who had not aban- or concealed it."

his case fall into two — claims 2, 5, 10 and 14 ions pertaining only to ystallinity, melt indices, and type of monomer. 5, reproduced above, is Pont has concede^d that therman copolymers of s country before the Du sified those limitations.³ ed that the copolymers of 14 are anticipated by the ps, we reverse the district on with respect to these ese claims invalid. group of claims — claims be addressed on remand. include a limitation not

conceded as follows:

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lene-1-hexene copolymers had density, percent crystallinity nt comonomer content fall- s expressly called for by the gaint Phillips in this action of 0.19 and 0.27.

not attempt to prove in this nvention of the patent in suit 'ont before the dates that those ie copolymers and ethylene-1- rs were made by Gerald T. Donald R. Witt.

present in the other four claims and not conceded by Du Pont to be present in the Witt and Leatherman copolymers. Claim 1 includes this limitation: "when in the form of a film, an Elmendorf tear strength in the range of 150 to 400 grams per mil." Claim 12, which claims the copolymer in the form of pipe, recites a limitation to impact strength in terms of hoop stress. To find anticipation of claims 1 and 12, the district court must determine that Phillips met its burden of proving by clear and convincing evidence that the copolymers it made prior to Du Pont's invention possessed those properties. See *American Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1360, 220 USPQ 763, 771 (Fed. Cir.), cert. denied, 469 U.S. 821 [224 USPQ 520] (1984).

Phillips asserts, citing *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985), that the strength limitations of claims 1 and 12 are merely property limitations that cannot serve to distinguish the claims from the Witt and Leatherman copolymers. In *Titanium*, the claims covered, for example, a "titanium based alloy consisting essentially by weight of about 0.6% to 0.9% nickel, 0.2% to 0.4% molybdenum, up to 0.2% maximum iron, balance titanium, said alloy being characterized by good corrosion resistance in hot brine environments." The reference upon which both the Patent Office and the court based their §102 rejections showed an alloy with those percentages, and the court stated:

Congress has not seen fit to permit the patenting of an old alloy, known to others through a printed publication, by one who has discovered its corrosion resistance or other useful properties, or has found out to what extent one can modify the composition of the alloy without losing such properties.

Id., 778 F.2d at 782, 227 USPQ at 778.

Titanium, however, does not mean that property limitations can never have meaning in a claim. On occasion, particularly with polymers, structure alone may be inadequate to define the invention, making it appropriate to define the invention in part by property limitations. As the district court here recognized in assessing the issues under 35 U.S.C. §112, "if the claims, read in light of the specification, reasonably apprise those skilled in the art both of the utilization and scope of the invention, and if the language is as precise as the subject matter permits, the courts can demand no more." *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d

1367, 1385, 231 USPQ 81, 94 (Fed. Cir. 1986), cert. denied, 107 S.Ct. 1606 (1987).⁴

Here, the district court found that "[t]he ethylene-higher alpha-olefin copolymers of the invention are characterized by several parameters so that they can be distinguished by external tests from linear ethylene homopolymers and from linear ethylene copolymers that are rubber-like." *Du Pont*, 656 F.Supp. at 1350, 2 USPQ2d at 1547. The district court concluded that those parameters "are measurements of comonomer content, density, and percent crystallinity." *Id.* However, the district court implicitly used additional parameters to help define the claimed invention because it read into the claims the two property limitations discussed above in Part I, A, and considered the Elmendorf strength of claim 1 and hoop stress of claim 12 in determining validity and infringement.

Furthermore, Du Pont's expert, Dr. Beasley, testified that "if process parameters are not identical in two polymerizations intended to make ethylene copolymers using the same monomers, the resultant copolymer will probably have different properties." The district court accepted that and noted: "the court now assumes that Phillips is not urging the theory initially espoused by Dr. Price that compounds that have the same general chemical structure will have the same properties regardless of how they are made." Thus, the district court found the interpolymers actually produced depends in part on the process used to prepare it. *Du Pont*, 656 F.Supp. at 1365, 2 USPQ2d at 1560.

It is clear, therefore, that the district court correctly regarded the claimed interpolymers as compositions that can be permissibly defined in terms of structure and properties. Thus, the issue is not, as in *Titanium*, whether one can get a patent on discovering a new property of an old composition of matter. The issue is whether the claimed copolymer, as defined in part by various property parameters, is new. In *Titanium*, once the alloy disclosed in the prior art reference was determined to possess the structural limitations of the claim, the burden shifted to the applicants to show that the alloy disclosed in the reference did not possess the claimed property. Here, however,

⁴ Compare *Seattle Box, Inc. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 826, 221 USPQ 568, 574 (Fed. Cir. 1984) (the test for adequacy under §112-12 is "whether one of ordinary skill in the art would understand what is claimed when the claim is read in light of the specification").

Phillips has not shown that their interpolymers of ethylene and higher alpha olefins possess the property limitations set forth in the claims.

As the one challenging validity, Phillips must prove on remand that the strength limitations of claims 1 and 12 are possessed by the Witt and Leatherman products. See *Tyler Refrigeration v. Kysor Industrial Corp.*, 777 F.2d 687, 689, 227 USPQ 845, 846-47 (Fed. Cir. 1985) (identity of invention is question of fact and challenger must show that each element of claim is found in a prior patent or publication, either expressly or under principles of inherency). In meeting that burden, Phillips need not prove awareness by Witt and Leatherman that their products possessed the properties. Also, Phillips is entitled to rely not only on the Witt and Leatherman patent application and its corresponding foreign patent applications, but also on the notebook data presented by Phillips. The district court did not allow Phillips to use that data regarding the two improper claim limitations discussed above in Part I, A, because it determined that the data on stress crack resistance was "abandoned, suppressed, or concealed." Du Pont, 656 F.Supp. at 1355-56, 2 USPQ2d at 1551-52. That was legally incorrect if 35 U.S.C. §102(g), as opposed to the Federal Rules of Evidence, was used as the basis of excluding the data. The inquiry under §102(g) allows Phillips to use any relevant data to prove its defense unless the information is otherwise untimely produced.

C. Nonobviousness

As the district court recognized, determining nonobviousness is a legal question based on factual underpinnings. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 USPQ 459, 567 (1966); *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1566-68, 1 USPQ2d 1593, 1596-97 (Fed. Cir.), cert. denied, 107 S.Ct. 2187 (1987). Changing the definition of the claims used by the district court by eliminating the two limitations it improperly read into the claims may affect a number of those factual inquiries and the legal conclusion itself. Because of that, we deem it appropriate for the district court to reassess the nonobviousness of claims 1 and 12 as properly defined. We can review that legal assessment, in any subsequent appeal, for error or the underlying fact findings for clear error.

However, because the district court applied an incorrect test in excluding the work of Witt and Leatherman as prior art for §103 purposes, we give guidance to the court on one aspect of one of the factual underpin-

nings of nonobviousness, the "scope and content of the prior art." *Id.* Specifically, we now address when §102(g) prior work can be used as §103 prior art.

[3] The district court in excluding the work of Witt and Leatherman applied a test derived from *In re Clemens*, 622 F.2d 1029, 1039-40, 206 USPQ 289, 299 (CCPA 1980): the work of another under §102(g) is prior art under §103 only when that work is known to the art or to the patentee before he made the invention. See, e.g., *Kayton on Patents*, 5-28 (2d ed. 1983). Applying that test, the district court held that Phillips' prior work was not usable in a §103 context "[b]ecause Phillips' work was kept secret and was unknown to both the du Pont researchers and the art." *Du Pont*, 656 F.Supp. at 1363, 2 USPQ2d at 1558. The district court also relied on *Kimberly-Clark Corp. v. Johnson & Johnson*, 745 F.2d 1437, 223 USPQ 603 (Fed. Cir. 1984), and Phillips contends that *Kimberly-Clark* eliminated the test of *Clemens*. We agree with Phillips.

Kimberly-Clark distinguished as dictum the *Clemens* requirement of applicant's personal knowledge because "§102(g) contains no personal knowledge requirement." 745 F.2d at 1445, 223 USPQ at 607. Nor does §102(g) contain a "known to the art" requirement apart from the requirement of no abandonment, suppression or concealment. Hence, the alternative *Clemens* requirement that the prior work be "known to the art" is also implicitly dismissed as dictum. That implication is further supported by the conclusion in *Kimberly-Clark* that certain prior work at issue, solely because it satisfied §102(g) (i.e., it was reduced to practice and had not been abandoned, suppressed or concealed), could be used for §103 purposes. *Id.*, 745 F.2d at 1444, 223 USPQ at 606; see also *Hybritech Inc. v. Monoclonal Antibodies*,

⁵ Because work is "secret" does not necessarily mean that it has been "abandoned, suppressed or concealed." The latter determination depends on the overall facts of each case. For example, the filing of a United States patent application, as Phillips did here, maintains the secrecy of work; but is a factor cutting against abandonment, suppression or concealment. In any event, Du Pont conceded that the prior Phillips work has not been abandoned, suppressed or concealed, e.g., it admits in its reply brief that the Witt and Leatherman work is "available as a defense of prior invention under Section 102(g)." In that regard, the Phillips' work was the subject of foreign patent applications, speeches at various conferences, and papers presented at American Chemical Society meetings.

Inc., 802 F.2d 184 n.1 (Fed. Cir. 1986). The effect of §103 is limited by the 1984. Pursuant to 35 U.S.C. §103 another person, under subsection (b), shall not be entitled to a patent if the invention were made, owned by or obligation of ass

The concurring opinion in *Kimberly-Clark*, 745 F.2d 1276, 177 properly characterized the term "prior art" under 35 U.S.C. §103 which were not applicant or regardless of made public them are file are found not suppressed, 474 F.2d at 1276, although there was no a concealment because that issue require that a patent be issued can qualify as

Certainly the work was concerned F.2d at 1446, unless the requirement, suppress, somewhat the prior art, Desj prior art," the lowered prior work §103 context requirements of the currying opinion jority opinion what constitut other, under §1 work of another practice." 745 619 (footnote 6)

II. Infringement
As indicated court's claim in the two proper claims and, with Phillips has no for claims 2, claims 1 and

⁶ The effect of §103 is limited by the 1984. Pursuant to 35 U.S.C. §103 another person, under subsection (b), shall not be entitled to a patent if the invention were made, owned by or obligation of ass

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"secret" does not necessarily en "abandoned, suppressed or ter determination depends on each case. For example, the States patent application, as maintains the secrecy of work, ng against abandonment, sup- plement. In any event, Du Pont rior Phillips work has not been ised or concealed, e.g., it ad- ef that the Witt and Leather- ilable as a defense of prior ction 102(g)." In that regard, as the subject of foreign patent ies at various conferences, and t American Chemical Society

Inc., 802 F.2d 1367, 1371 n.1, 231 USPQ 81, 84 n.1 (Fed. Cir. 1986) (§102(g) prior art can be used for §103).

The concurring opinion in *In re Bass*, 474 F.2d 1276, 177 USPQ 178 (CCPA 1973), properly characterized the proposition for which *Kimberly-Clark* stands by stating:

[t]he term 'prior art' as it is used in 35 U.S.C. §103 should include all inventions which were made in this country before an applicant or patentee made his invention, regardless of when those inventions are made public or patent applications on them are filed, so long as those inventions are found not to have been abandoned, suppressed, or concealed.

474 F.2d at 1292, 177 USPQ at 190. Moreover, although *Kimberly-Clark* concluded there was no abandonment, suppression, or concealment because of a filed patent application that issued, *Kimberly-Clark* does not require that a patent application be filed or a patent be issued before §102(g) prior work can qualify as §103 prior art.

Certainly the court in *Kimberly-Clark* was concerned about "secret prior art." 745 F.2d at 1446, 223 USPQ at 607. Nevertheless the requirement of proving no abandonment, suppression, or concealment does mollify somewhat the "secret" nature of §102(g) prior art. Despite its concern over "secret prior art," the court in *Kimberly-Clark* allowed prior work to be used as prior art in a §103 context so long as it satisfied the requirements of §102(g). As stated in the concurring opinion in *Kimberly-Clark*, the majority opinion "has extended the scope of what constitutes the prior invention of another, under §102(g), to encompass the prior work of another which has been reduced to practice." 745 F.2d at 1460, 223 USPQ at 619 (footnote omitted).⁶

II. Infringement

As indicated above, we reverse the district court's claim interpretation with respect to the two property limitations "read into" the claims and, with respect to the judgment that Phillips has not proven invalidity, we reverse for claims 2, 5, 10 and 14 and vacate for claims 1 and 12. Thus, the judgment of

⁶ The effect of using §102(g) for §103 purposes is limited by the Patent Law Amendments Act of 1984. Pursuant thereto, this sentence was added to 35 U.S.C. §103: "Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title; shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person."

infringement must also be vacated. However, on the infringement issue it is appropriate for judicial economy to review Phillips' challenge to the district court's interpretation of the density and crystallinity parameters appearing in claims 1 and 12.

A. Density

Phillips urges that the "0.95" limitation appearing in the claims means "0.950" and that the district court incorrectly interpreted "0.95" as meaning between 0.9451 and 0.9550. Consequently, Phillips urges that the district court incorrectly found that Phillips' products, having a density between 0.9501 and 0.9550, literally infringed the claims at issue.

[4] Phillips urges that during the prosecution history Du Pont made arguments on the meaning of the density that are contrary to the district court's interpretation. We agree with Phillips that arguments made during the prosecution history are relevant in determining the meaning of the terms at issue. Those arguments, and other aspects of the prosecution history, as well as the specification and other claims, must be examined to ascertain the true meaning of what the inventor intended to convey in the claims: *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 867, 228 USPQ 90, 93-94 (1985). Using the prosecution history in that manner is different from prosecution history estoppel, which is applied as a limitation upon the doctrine of equivalents after the claims have been properly interpreted. *Id.*, 781 F.2d at 870, 228 USPQ at 96. The district court here incorrectly assumed that prosecution history can be used only in the latter regard. After noting that "Phillips advanced five prosecution history estoppel arguments related to the claim parameters of density, crystallinity and comonomer content in an effort to restrict the scope of the asserted claims," *Du Pont*, 656 F.Supp. at 1388, 2 USPQ2d at 1579, the court concluded that none of the arguments "involve the classic situation for estoppel, such as if Du Pont had narrowed a claim by amendment and now sought to require what was given up by resort to the doctrine of equivalents." *Id.*

In interpreting "0.95" the district court referred to the specification and to "customary scientific notations." *Id.* at 1385, 2 USPQ2d at 1577. However, during prosecution Du Pont argued that a density between 0.950 and 0.955 was not within the scope of its claims. This position is inconsistent with the claim interpretation Du Pont now urges. Specifically, the examiner rejected Du Pont's pending claims, stating in part: "Since

the polymers disclosed by the [Field and Feller (F&F)] references have densities within the scope of applicants' claims ... it is not seen how the instantly claimed copolymers differ from those of the references." (Emphasis added.) In response, Du Pont argued:

[W]herever given in Field and Feller, the densities of the 'normally solid hydrocarbon material' polymerization product, where some olefinic material, other than propylene, was included in the reaction mixture with ethylene, were in the range of linear polyethylene homopolymers (0.954 - 0.97) rather than in the range (0.9 to 0.95) of the novel branched polyethylenes (ethylene 1-olefin copolymers) claimed by applicants.

The examiner posited in the rejection that the F&F densities, including one of 0.9547, were within the scope of Du Pont's claims (0.9 to 0.95), but that was contested by Du Pont.

Du Pont argues that the examiner, in subsequently withdrawing his rejection, placed no reliance on the 0.95 density recitation to distinguish F&F. That misses the point.

Regardless of the examiner's motives, arguments made during prosecution shed light on what the applicant meant by its various terms. Not only did Du Pont argue that an F&F density of 0.954 fell outside the scope of its claims but also, regarding the next highest F&F density, 0.9557, Du Pont stated that it was "far above" any densities of applicant's unique, branched polyethylenes. Du Pont also stated that the F&F density of 0.9585 had a "quite high density."

In light of that prosecution history, as well as other factors such as the patent specification, the district court should ascertain on remand the meaning of the density parameter. If the court determines that the parameter has changed, it should reassess infringement. We caution, however, that even if the district court decides in light of the prosecution history to redefine the density as 0.950, and accordingly, changes its finding of literal infringement for those products of Phillips having a density between 0.9501 and 0.9550, the issue of infringement under the doctrine of equivalents must be addressed by the court. As indicated in *Loctite Corp. v. Ultra-seal Ltd.*, 781 F.2d 861, 871, 228 USPQ 90, 96 (Fed. Cir. 1985), merely because certain prosecution history is used to define the claims more narrowly, there still may be—even in light of that same prosecution history—an appropriate range of equivalents under the doctrine of equivalents.

B. Crystallinity

On crystallinity, Phillips urges that the 70% maximum limitation means "70%," not "70% \pm a variance of 10%-20%" as interpreted by the district court. As with density, the district court seemed to find prosecution history relevant only in an estoppel context. That, again, is incorrect. With Phillips' interpretation, products over 70% would not literally infringe; with the district court's interpretation, some were held to infringe literally.

The district court seemed to ignore arguments made during the reissue/reexamination proceeding that prior art polymers including those with crystallinity of 38%, 32%, and 38% were "outside the scope of appellant's claims." Statements made during reissue are relevant prosecution history when interpreting claims. See, e.g., *Howes v. Medical Components*, 814 F.2d 638, 645, 2 USPQ2d 1271, 1275 (Fed. Cir. 1987); *Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 452, 227 USPQ 293, 296 (Fed. Cir. 1985).

It is relevant to the claim interpretation here that Du Pont urged that something 2% off the claimed lower limit of 40% is not in the range, yet later argued for a variance of 10%-20% off the upper limit. As with density, therefore, we instruct the district court judge on remand to reassess the meaning of the crystallinity parameter. Again as with density, however, even if the district court redefines the parameter as "70% without variance," the issue of infringement under the doctrine of equivalents must still be addressed.

C. Remand Instructions

On remand, the district court should ascertain the meaning of a density of "0.95" and a crystallinity of "70%." If it means "0.950" density or "70% without variance" crystallinity, infringement will have to be reassessed under the doctrine of equivalents for those Phillips products having a density over 0.950 or a crystallinity over 70%. However, the instruction to reassess the definitions of "0.95" and "70%" does not affect the infringement determination unchanged on appeal for those infringing Phillips products that have a density below 0.950 and a crystallinity less than 70%.

III. Inequitable Conduct

Phillips alleges as inequitable conduct (1) Du Pont's failure to inform the PTO about the alleged status of Du Pont's Rule 131 affidavit, and (2) Du Pont's improper selection of data. The district court rejected those

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arguments apparently because it found that Phillips failed to prove by clear and convincing evidence that the alleged misrepresentations were material. Phillips has not shown us that those findings were clearly erroneous, *J.P. Stevens & Co. v. Lex Tex Ltd.*, 747 F.2d 1553, 1562, 223 USPQ 1089, 1094 (Fed. Cir. 1984), *cert. denied*, 474 U.S. 822 (1985), nor that the conclusions of no inequitable conduct were otherwise incorrect. In reaching that conclusion in the context of this case, we are reminded of this admonition of *Kimberly-Clark v. Johnson & Johnson*, 745 F.2d 1437, 1454, 223 USPQ 603, 614 (Fed. Cir. 1984): "'Fraud in the PTO' has been overlaid, is appearing in nearly every patent suit, and is cluttering up the patent system."

IV. Willfulness

The district court decided that Du Pont did not prove willfulness by clear and convincing evidence, although it stated that Du Pont would have proven infringement if the standard of proof had been a preponderance of the evidence. Du Pont argues on appeal that willful infringement need only be proved by a preponderance of the evidence. *Du Pont*, 656 F.Supp. at 1394, 2 USPQ2d at 1584. That is legally incorrect. As this court stated in *Shatterproof Glass Corp. v. Libbey-Owens Ford Co.*, 758 F.2d 613, 628, 225 USPQ 634, 644 (Fed. Cir. 1985): "[t]he jurisprudence . . . uniformly requires clear and convincing evidence in support of increased damages."

Du Pont cites *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1569, 1583, 1 USPQ2d 1081, 1083, 1094 (Fed. Cir. 1986). There the court did not specifically focus on the proper standard to apply, but, when discussing the procedural history at the district court it stated generally that the "54 jointly prepared questions . . . [submitted to the jury] . . . recognized the appropriate burdens to be met by each of the parties as well as the corresponding standard of proof with respect to each issue." *Id.* at 1569, 1 USPQ2d at 1083. One of the standards, not discussed in the opinion, is revealed by question 24, contained in the APPENDIX to the opinion: "Do you find that Orthokinetics has proved by a preponderance of the evidence that the infringement of the ['867] patent by any of the following defendants was willful?"

[5] Obliquely, therefore, *Orthokinetics* might support Du Pont's position. However, *Orthokinetics* never focused on the issue, and we conclude that *Orthokinetics* never intended to change the proper test stated in *Shatterproof*.

DECISION

In view of the foregoing: (1) the district court's claim interpretation is (a) reversed insofar as it has "read into" the claim two extraneous property limitations, and (b) vacated insofar as it has interpreted a density limitation of "0.95" to mean "0.9451 - 0.9550" and a crystallinity limitation of "70%" to mean "70% \pm 10-20%"; (2) the district court's judgment that Phillips did not prove invalidity under 35 U.S.C. §102(g) is reversed for claims 2, 5, 10, and 14 and vacated for claims 1 and 12; (3) the district court's judgment that Phillips did not prove invalidity under 35 U.S.C. §103 is vacated for all claims; (4) the district court's judgment that Phillips did not prove unenforceability is affirmed; (5) the district court's judgment that Du Pont proved infringement is vacated; and (6) the district court's judgment that Du Pont did not prove willful infringement is affirmed. This case is remanded for further proceedings consistent with this opinion.

COSTS

Costs are awarded to Phillips.

AFFIRMED IN PART, REVERSED IN PART, VACATED IN PART AND REMANDED

APPENDIX

1. An interpolymer composed of interpolymerized comonomers consisting essentially of ethylene and at least one normal aliphatic mono-alpha-olefinic hydrocarbon containing from 5 to 10 carbon atoms per molecule, the proportion of said monoolefinic hydrocarbon being from 3 to 7% of the weight of the interpolymer, said interpolymer having a melt index within the range of 0.3 to 20, and, when in the form of a film, an Elmendorf tear strength in the range of 150 to 400 grams per mil, and a density of 0.93 to 0.94.

2. An interpolymer of ethylene and from 1% to 20% by weight of a higher olefinic hydrocarbon having 5 to 18 carbon atoms per molecule, said higher olefinic hydrocarbon having no non-aromatic unsaturation other than one terminal $-CH=CH_2$ per molecule, said interpolymer having essentially no other copolymerized components; the proportion of the interpolymerized ethylene component therein being not less than 80% nor more than 90% by weight; the percentage crystallinity of the interpolymer being such that the density ranges from 0.95 at 1% interpolymerized higher olefinic hydrocar-

bon down to 0.9 at 20% interpolymerized higher olefinic hydrocarbon.

5. An interpolymer of ethylene and a higher olefinic hydrocarbon having 5 to 10 carbon atoms per molecule, said higher olefinic hydrocarbon having one terminal $-CH=CH_2$ per molecule and no other olefinic unsaturation, said interpolymer being further characterized in that it has an X-ray crystallinity in the range of 40 to 70%, a melt index in the range of 0.3 to 20, a density in the range of 0.9 to 0.95 and said interpolymer being further characterized in that its density is not less than 0.93 unless the content of said higher olefinic hydrocarbon in the interpolymer is at least 3% by weight.

10. Composition of claim 5 in the form of a film.

12. Composition of claim 5 in the form of pipe which is further characterized by withstanding 3000 hours at hoop stress of 750 psi and a temperature of 60°C.

14. A composition of claim 5 having a density in the range of 0.910 to 0.945 and a melt index in the range of 0.3 to 2.1.

District Court, N.D. Indiana

Haan Crafts Corp. v. Craft Masters Inc.

No. L 87-95

Decided March 3, 1988

Amended March 30, 1988

TRADEMARKS AND UNFAIR TRADE PRACTICES

1. Types of marks — Secondary meaning (§327.02)

— Trade dress as mark — In general (§327.0702)

Plaintiff's sewing kits for common stuffed animals, which are sold to schools, are not distinctive, even if plaintiff is only manufacturer to offer such items as sewing kits, nor have such products acquired secondary meaning in school sewing kit market, although plaintiff's kits for "Fuzzy Foot" and "Fancy Feet" are distinctive.

COPYRIGHTS

2. Notice, deposit, and registration — Registration — In general (§207.0701)

Infringement pleading and practice — Jurisdiction (§217.05)

Copyright infringement plaintiff who obtained certificate of registration after suit

was filed but who amended complaint to expressly reference those registrations, and who has attached notices of copyright to all publicly distributed copies of allegedly infringed sewing kits, has satisfied conditions precedent to bringing infringement action.

3. Elements of copyright — Statutory elements — Originality (§205.0707)

Copyright infringement plaintiff's "Fancy Feet" and "Rocky" mail order sewing kits possess requisite originality to warrant finding of substantial likelihood of success on merits of plaintiff's claim, although such likelihood of success does not exist with regard to plaintiff's catalog, in view of lack of any substantial similarity, in those parts of catalog that are protected by copyright, between plaintiff's and defendant's catalog.

4. Infringement pleading and practice — Relief and damages — Seizure, forfeiture, and injunction (§217.1107)

Manufacturer of mail order sewing kits sold to schools has failed to prove irreparable harm, in its request for preliminary injunctive relief against competitor for its sale of allegedly infringing kits to schools, since both parties' orders for 1987-1988 school year have been filled, and thus remedy at law in damages is adequate, although injunctive relief is warranted as to "Fancy Feet" kit that was copied by defendant in deliberate and knowing effort to thwart plaintiff's introduction of such item.

Plaintiff Haan Crafts Corp. brought copyright and trademark infringement action against Craft Masters Inc. and Jerald W. Chitwood. On plaintiff's motion for preliminary injunction. Granted in part and denied in part.

John C. McNett and James M. Durlacher, Indianapolis, Ind., and Jerome L. Withered, Lafayette, Ind., for plaintiff.

Richard T. Heide, Lafayette, for defendants.

Sharp, C.J.

Plaintiff's Motion for a Preliminary Injunction was heard in open court in Lafayette, Indiana, on September 18, November 12, and November 13, 1987, respectively. At this court's request, the parties have since filed post-preliminary injunction hearing briefs. Based on the information and arguments presented, both orally and in writing, this court now makes findings of

facts and conclusions. Rule 52 of the Federal Rules of Civil Procedure. For reasons stated, plaintiff's motion is hereby **DENIED** in part.

This court has jurisdiction over the cause of action which gives rise to the claim of all civil of the United States. Plaintiff claims that defendant's complaint in this case is a violation of the Uniform Trademark Act, Title 15 U.S.C. §11338, which prohibits infringement of a trademark.

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DOCKET NO.: 95-0134.05



**SUBSTITUTE SPECIFICATION
(MARKED VERSION)**

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FOR

**ANGULARLY OFFSET STACKED DIE MULTCHIP
DEVICE AND METHOD OF MANUFACTURE**

INVENTOR(S):

**Rich Fogal
Michael B. Ball**

Certificate of Mailing (37 C.F.R. § 1.8)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231, on the date below:

2/19/02 *Susan Jerome*
Date Signature

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(208) 368-4557**

~~TITLE OF INVENTION:~~ ANGULARLY OFFSET STACKED DIE MULTICHIP
MULTICHIP DEVICE
DEVICE AND METHOD OF MANUFACTURE

~~INVENTORS:~~ Rich Fogal, Michael B. Ball, both of Boise, ID.

~~5~~

~~ASSIGNEE:~~ Micon Technology, Inc.

DESCRIPTION

10

BACKGROUND OF THE INVENTION

RELATED APPLICATIONS

[0001] This application is a divisional of U.S. Application Ser. No. 09/122,666, filed July 24, 1998 and issued as U.S. Patent No. 6,051,886; which is a continuation of U.S. Application Ser. No. 08/741,579, filed Nov. 1, 1996 and issued as U.S. Patent No. 5,874,781; which is a continuation of U.S. Application Ser. No. 08/515,719, filed Aug. 16, 1995 and now abandoned.

TECHNICAL FIELD.

[0002] This invention generally relates to semiconductor devices. ~~More~~

More particularly, this

invention relates to a multichip module which employs stacked dice.

BACKGROUND OF THE INVENTION

~~Background.~~ [0003] Semiconductor devices are constructed from a silicon or gallium

15

arsenide wafer through a process which comprises a number of deposition, masking, diffusion, etching, and implanting steps. Usually, many individual devices are constructed on the same wafer. When the devices are sawed into individual rectangular units, each takes the form of an integrated circuit (IC) die. In order to interface a die with other circuitry, normally it is mounted on a lead-frame paddle, in the case of single chip

20 construction, or a multichip module substrate which in either case are surrounded by a number of lead fingers within a lead-frame. Hereafter general reference will be made by

use of the word "substrate" as meaning either a paddle or a multichip module substrate or their functional equivalents.

25 [0004] The die-mounting substrate of a standard lead-frame is larger than the die itself,
and it is surrounded by multiple lead fingers of individual leads. Bonding pads on the die
are connected one by one in a wire-bonding operation to the lead-frame's lead finger pads
with extremely fine gold or aluminum wire. The lead-frames are connected together for
manufacturing purposes into a strip. Each strip generally consists of a linear series of
interconnected lead-frames, typically ten in a row, one after another. Then the die and the
30 portion of the lead-frame to which the die is attached, are encapsulated in a plastic or

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ceramic material to form the chip package, as are all other die/lead-frame assemblies on the lead-frame strip. A trim-and-form operation then separates the resultant interconnected packages and bends the leads of each package into the proper configuration.

5—[0005] In many cases, multichip devices can be fabricated faster and more cheaply than a corresponding single IC which incorporates the same functions. Current multichip module construction typically consists of a printed circuit board substrate to which a series of separate components are directly attached. This technology is advantageous because of the increase in circuit density achieved. With increased density comes improvements in
10 signal propagation speed and overall device weight. While integrated circuit density has and continues to increase at a significant rate, the density of the interconnecting circuitry between a die and its leads, and between two components within a multichip module, has not kept pace. Consequently, interconnection density has become a significant limiting factor in the quest for miniaturization.

15—[0006] U.S. Pat. No. 5,012,323, issued Apr. 30, 1991, having a common assignee with the present application, discloses a pair of rectangular integrated-circuit dice mounted on opposite sides of the lead-frame. An upper, smaller die is back-bonded to the upper surface of the lead fingers of the lead-frame via a first adhesively coated, insulated film layer. The lower, slightly larger die is face-bonded to the lower surface of the lead
20 extensions within the lower lead-frame die-bonding region via a second, adhesively coated, insulative, film layer. The wire-bonding pads on both the upper die and the lower die are interconnected with the ends of their associated lead extensions by gold or aluminum wire. The lower die needs to be slightly larger for accessibility to the die pads from above allowing gold wire connections to the lead extensions or fingers.

25—[0007] U.S. Pat. No. 4,996,587 shows a semiconductor chip package which uses a chip carrier to support the chips within a cavity. The chip carrier as shown in the figures has a slot that permits connection by wires to bonding pads which, in turn, connect to the card connector by conductors. An encapsulation material is placed only on the top surface of

the chip in order to provide heat dissipation from the bottom surface when carriers are
30—stacked.

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stacked.

[0008] Japanese Patent No, 56-62351 (A) issued to Sano in 1981 discloses three methods of mounting two chips on a lead-frame and attaching the pair of semiconductor chips or pellets to a common lead-frame consisting of: (method 1) two chips mounted on two paddles; (method 2) one chip mounted over a paddle and one below not attached to the
5 paddle; and (method 3) one chip attached above and one chip attached below a common paddle.

[0009] U.S. Patent Nos. ~~5,232,060~~5,323,060 and 5,291,061, both having a common assignee with the present application, teach arrangements of multichip stacked devices wherein a first die is attached to the substrate and wire bonded to the lead fingers, followed by a second die
40 and so on. Both patents teach using an adhesive layer between two dice to provide clearance between the dice for the loops of the wire bonds. The wire bonds attaching an underlying die must be completed before another die can be stacked on the stack. This means that the die attachment process must be repeated for each additional layer of the stack. In addition to adding extra process steps, there is a chance of damaging the
45 underlying wires. Additionally, because the clearances between two adjacent dice in the stack are quite tight, small variances in the loop height and adhesive thickness can lead to a compound error which results with the wire loops of the underlying die contacting or interfering with the upper die.

20

SUMMARY OF THE INVENTION

[0010] Accordingly, it is one object of the present invention to provide a stacked multichip device which allows at least two dice in a stack to be attached to the substrate
25 prior to wire bonding.

—————Is it [0011] It is another object of the present invention to provide a stacked multichip device

which does not restrict the loop height for the underlying die, thereby allowing thinner layers of adhesive separating the dies, facilitating ease and efficiency of wire bonding and reducing the overall height of the assembly.

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[0012] In accordance with the present invention, these and other objects are achieved by an offset die stacking arrangement in connection with at least one upper level die having a width which is less than the distance separating the opposing bonding sites of the underlying die. The upper die is fixed above the lower die and rotated within a plane
5 parallel to the lower die through an angle which insures that none of the bonding sites of the lower die are obstructed by the upper die. Dependent upon the geometries of the dice, additional dice can be stacked in this manner until the addition of an additional die would interfere with wire bonding of any of the lower dice. Once the dice are fixed in this
10 manner, the entire assembly is subjected to the wire bonding process with all of the bonds being made in the same step. The entire process can then be repeated using the upper most die of the previous stack as the substrate.

[0013] Additional objects, advantages and novel features of the invention will be set forth in part in the description that follows, and in part will become apparent to those skilled in the art upon examination of the following or may be learned by practice of the invention.
15 The objects and advantages of the invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

20

- [0014] Fig. 1 is a side view of a two die multichip device;
[0015] Fig. 2 is a top view of a first die attached to a substrate;
[0016] Fig. 3 is a top view of a first and second die attached to a substrate; and
[0017] Fig. 4 is a side view of a three die multichip device.

25

[0018] Fig. 5 is a top view of two die attached to a substrate.

DETAILED DESCRIPTION OF THE INVENTION

[0019] Referring now to FIGS. 1-4, a multichip device according to the invention is
30 designated generally at reference numeral 10. Such is comprised of a conventional

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substrate 12 which includes one or more Z-direction multichip stacks similar to those indicated at 14 and 16. For the purposes of this explanation, substrate 12 lies generally in the XY ~~plane~~ and the chip stacks extend upwardly parallel with the Z axis. However, it should be noted that the invention is not limited to this orientation and the coordinate
5 system could describe stacks extending in the X or Y directions, as well as any other direction. Consequently, directional and position descriptors such as upper, lower, above, below, etc. are adopted merely for the convenience of illustration and explanation and are not intended to limit the orientation or scope of the invention.

10 [0020] Referring first to stack 14, such includes a lower first die 18 having opposed base and upper bonding surfaces 20 and 22, respectively. Base surface 20 is here adhered to substrate 12 by means of an adhesive, such as epoxy, thermoplastic materials, tape, tape coated with thermoplastic materials, etc. First die bonding face 22 includes a central area 24 and a plurality of bonding pads 26 which are peripheral to central area 24 and generally lie adjacent opposing side edges 27.

15 [0021] Multichip stack 14 also includes an upper second die 28 having opposed base and upper bonding surfaces 30 and 32, respectively. Second die bonding surface 32 includes a central area 34 and a plurality of bonding pads 36 peripheral to central area 34. A first adhesive layer 38 is interposed between and connects first die bonding surface 22 and second die base surface 30. First adhesive layer 38 is deposited within central area 24
20 inside of peripheral bonding pads 26.

[0022] Referring particularly to Figs. 2 and 3, upper second die 28 is angularly offset with respect to lower first die 18 at an angle which is sufficient to insure that accessibility to bonding pads 26 is not interfered with. The angular rotation of second die 28 occurs in a plane which is generally parallel to upper bonding surface 22 of first die 18. The width of
25 upper second die 28 must be less than or equal to the perpendicular distance, W, separating opposing bonding pads 26 along opposite edges 27 of lower die 18. Constructing second die 28 with a width which is less than W allows for additional dies to be stacked without interfering with the vertical line of sight of any of the lower dies'

bonding pads, thereby allowing wire bonding of all bonding sites in the same wire bonding

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process step. The angle of offset, (α , represents the angle between the longitudinal centerline, l , of the underlying die and the longitudinal centerline, l' , of the overlying die. The minimum angle of offset, α , required for a die having a given opposite bonding pad separating distance, W , and an aggregate bonding pad length, L , is given by the formula

5. ~~$\alpha = \tan^{-1}\left(\frac{W}{L}\right)$~~ $\alpha = 2 \tan^{-1}\left(\frac{L}{W}\right)$

The maximum number, N , of chips or dies of a given opposite bonding pad separating distance, W , and a given distance, L , equal to the maximum distance between the outermost two edges of the two outermost bonding sites 26 on one of sides 27, is given by the formula

10. ~~$N = \frac{180}{\tan^{-1}\left(\frac{W}{L}\right)}$~~ $N = \frac{180}{2 \tan^{-1}\left(\frac{L}{W}\right)}$

Table 1 below lists the approximate maximum decimal expressions of R , which are the ratios of the length, L , per allowable separation distance, W , per unit length, L , for a given number of dies or chips, N .

N	R
2	1
3	.57
4	.41
5	.32
6	.26
7	.22
8	.19
9	.17

15 — **[0023]** A plurality of bonding wires 44 are bonded to and between respective first die bonding pads 26 and substrate 12. Bonding wires 44 have outwardly projecting loops 46. A plurality of second bonding wires 50 are bonded to and between respective second die bonding pads 36 and substrate 12. An example of wire bonding equipment capable of

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producing such wire bonds and loops is the model, 1484 XQ manufactured by Kulicke and Soffa Industries Inc. of Willow Grove, PA. Wires 44 and 50 can be provided bare or be externally insulated between ~~there~~their respective connections to the die bonding pads and multichip module substrate.

5 [0024] Second multichip stack 16 is substantially similar to first stack 14, and includes a subsequent second adhesive layer 52 and third upper die 54. Thus, at least one additional adhesive layer and at least one additional die is mounted outwardly relative to the second die bonding face. Here the offset angle, α , is equal to 90° simply for ease of illustration. In this case, third die 54 is attached in a separate wire bonding step. Such third die
10 includes a plurality of third die bonding wires 56. Third die 54 includes a central area 58 and associated peripheral bonding pads 60 which connect with third wires 56. Third die 54 can also include an overlying adhesive layer which can provide a level of additional protection to the top-most die in a multichip stack. Thus, third die 54 can be considered
15 as an outermost chip, with second adhesive layer 52 and/or second die 28 and/or first adhesive 38 being considered as intervening material interposed between the first die bonding surface and the outermost die base surface.

[0025] A third multichip stack is illustrated in FIG. 5, wherein components analogous to those in the embodiments discussed above are numbered similarly. In this stack, however, the offset angle, α , more closely illustrates the minimum angular offset.

[0026] While there is shown and described the preferred embodiment of the invention, it is to be distinctly understood that this invention is not limited thereto but may be variously embodied to practice within the scope of the following claims.

20 We claim:

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[0027] We claim:
